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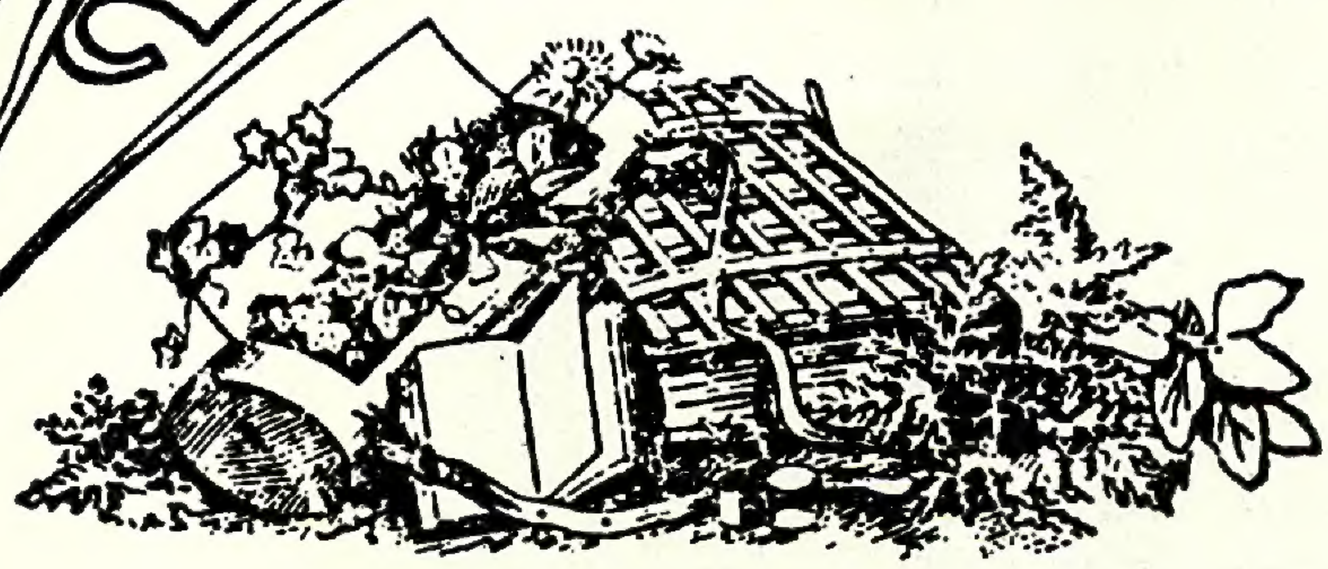

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by

Harley H. Bartlett and Rogers McVaugh

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HISTORY AND PHILOSOPHY OF JAPANESE FLOWER ARRANGEMENT

Mary Cokely Wood

Foreword, by H. H. Bartlett

During the fall of 1952 the University of Michigan and the Ann Arbor Citizens Flower Show sponsored a Japanese Festival through the collaboration of several units of the University, namely, the Museum of Art, the College of Architecture and Design, the Center for Japanese Studies and the International Center, and of several civic groups whose interest was enlisted through the Ann Arbor Citizens Flower Show, namely, the Ann Arbor Garden Club, the Garden Section of the Faculty Women's Club, and the Farm and Garden Club.

Prior to World War II the Alumni in Tokyo had provided for a gift to the University of Japanese cherries of the more hardy horticultural varieties, to be planted at Ann Arbor. At first, uncertainty about which varieties would be most likely to withstand the severe winters, and then the circumstances of the war and its aftermath, prevented anything being done about the matter until interest in it was renewed in 1951 by the present writer. The Japanese Festival was then arranged for the following summer. The Honorable Eikichi Araki, Ambassador of Japan, visited Ann Arbor, honoring the occasion by making the formal presentation of the gift in behalf of the Tokyo Alumni of the University, which was accepted by President Harlan Hatcher.

The reason for the Japanese Festival was so well stated by Professor Jean Paul Slusser of the Museum of Art, that I venture to quote his explanation from the program of events which was issued by the University. He wrote:

"Nearly a century has elapsed since an American, Commodore Perry, opened up the Japanese Empire to western trade, and in this time there has been a constant interchange of ideas and influence between the United States and Japan. A climax to the impact, moral as well as material, of the two civilizations upon each other was reached in the war, now at least officially concluded. At this moment, when the treaty of peace between these two great nations has just been signed, *Japanese Festival* is presented both as a gesture of celebration and good will and as an attempt to promote a closer understanding of our friend and neighbor in the East.

"The present occasion, with its reference to several typical aspects of Japanese life and art, has developed naturally out of materials that were lying ready to hand. A store of enthusiasm for flowers and gardens has long existed in Ann Arbor, as also some special interest in the art of Japanese flower arrangement. An impressive number of Japanese objects is to be found in the private and public collections of this area. In the University itself, the Museum of Art, prompted by the direction towards Far Eastern studies in the Department of Fine Arts, has for some time been ready to undertake an oriental exhibition. The Center for Japanese Studies maintains a field branch in Okayama and has been an active influence of cultural interchange between the United States and Japan. Quite recently a group of Tokyo alumni made the University a present of flowering-cherry trees, and an occasion for dedicating these was definitely indicated. To members of the College of Architecture and Design staff the subject of Japanese architecture and interior design has been of increasing interest, particularly since many traditional tenets of Japanese building come close to the newer thinking of our own best men in these fields.

"*Japanese Festival* developed out of the ideas, wishes and plans of various persons, groups and organizations and was made possible through the generous contribution of advice, time, services and money on the part of a number of devoted individuals, some of them laymen, some of them specialists. In certain aspects it is an exhibition of art, in others a particular kind of flower show. A community as well as a University project, it has implications which reach beyond either one. Its sponsors hope that it may contribute to an understanding of a culture in which we as Americans are destined to be increasingly interested.

"As regards the installation, no attempt has been made to reproduce the exact details of a Japanese house and garden. Not only would this have been impracticable within the fixed limitations of space and budget, but it would have militated against the unity of style necessary for the total arrangement of the galleries. The intention throughout has been merely to suggest with greatly simplified means the spirit of the Japanese original."

The events of the Japanese Festival were spread over the period from 12 October through 2 November 1952. The Festival Exhibition of Japanese Art, was open in the galleries of Alumni Memorial Hall throughout the period, and the special events were as follows:

October 12. Opening of the three-day chrysanthemum show; First Demonstration of Japanese Flower Arrangement by Mrs. Tomoko Yamamoto.

October 13. Second Demonstration of Japanese Flower Arrangement, by Mrs. Yamamoto.

October 14. Lecure by Mrs. Mary Cokely Wood, "The History and Philosophy of Japanese Flower Arrangement."

October 19. The Presentation of the Goft of Japanese Flowering-Cherries by the Tokyo Alumni to the University.

October 23. Lecture by Professor James Marshall Plumer, "Japanese Sculpture."

November 2. Japanese Tea Ceremony, demonstrated by Japanese students at the University.

Needless to say, the success of the Japanese Festival depended upon the cooperation of far too many persons for all to be mentioned, but the central committee consisted of Mrs. Frederick A. Coller, who was especially responsible for promotion and personnel, Mr. Walter W. J. Gores, who was in charge of planning and directing, Professor Robert B. Hall, who provided Japanese materials, and Professor J. P. Slusser, who, assisted by Professor James M. Plumer, Mrs. Kamer Oga-Oglu, and Miss Helen B. Hall, was in charge of the art exhibits. The arrangement of a Japanese garden was undertaken by Professor Otto Laporte and Mrs. Robert F. Ward. The Chrysanthemum show was managed by Mrs. Robert T. Ball, Mrs. Raleigh Schorling and Mrs. Ruth Moser Place. Mural decorations, photographic and floral displays, and the doll exhibition were contributed by Mr. Donald B. Gooch, Mr. Richard Wilt, Mr. David Reider, Mr. Philip C. Davis, Mrs. Frank N. Wood, Mrs. C. Merle Dixon, Mr. Alfred Goodhew, and Mrs. Joseph K. Yamagiwa. The reception, the publicity, and the details of construction and installation were taken care of by Miss Linda Eberbach, Mrs. Otto Laporte, Mrs. Otto Graff, Mr. Aarre K. Lohti, Mr. Thomas F. McClure, and many others.

Mrs. Wood's lecture on the "History and Philosophy of Japanese Flower Arrangement" was illustrated by slides, and supplemented by an exhibition of recent and classical books on the subject, demonstrations of arrangements, and accessories for them, such as antique bronze vessels. Too much time and effort were devoted to it for her lecture to lie unpublished. Since it was especially interesting to the botanists and gardeners, we have considered it an obligation as well as a pleas-

ure to publish it in the Asa Gray Bulletin, feeling sure that our readers will enjoy it. Much has been written on Japanese flower arrangement that is merely trivial. Consequently many who think they know something about it have really only a superficial acquaintance. Mrs. Wood is the author of a successful book* on the subject which has met with commendation in Japan where it was published.

Asked about her background for writing on this subject, Mrs. Wood replied as follows:

"My interest arose from living in Nara, Japan, where my husband, Mr. Frank E. Wood, and I had been sent by the Brotherhood of St. Andrew of the Protestant Episcopal Church in America. We had always been interested in botany and since Japan is so rich in plants, every tree and flower and shrub and fern invited investigation.

"I had lessons at Nara from a teacher of the Ikenobo School in Kyoto about 1900. My early study of Japanese floral art resulted in steadily increasing interest, inviting research, which has been furthered by Japanese friends in both Japan and America. They have contributed much, especially in procuring for the the old block-printed books from which some of the illustrations for my article have been taken, and without access to which one can hardly be thought of as qualified to write on the history of the subject. I prize these old volumes among my dearest possessions, for it is difficult indeed to make a good collection of them. Even the best American libraries have only scanty or far from complete holdings.

"Since the War interest in Japanese Flower Arrangement has grown, much to the pleasure and satisfaction of those who have visited Japan and to those with whom they have talked. Japanese floral art has power, mentally, bodily and spiritually."

We were living in Kyoto in 1900, when my husband brought home one day in early spring, tickets to a Flower Show. A Flower Show was a new idea to me. I had never heard of such a think in America and I visualized it as many bouquets of spring flowers. I looked at the "tickets," neat pieces of white wood almost an inch thick and about $3\frac{1}{2}$ inches wide and 7 or 8 inches long, with Japanese characters brushed on in bold black ink.

At that time there were few foreigners in Kyoto. The appearance of one or more always drew a crowd of children crying "*Ejin san! Ejin san!*" meaning, "Oh! look at the foreigners." We never minded that, for they were not meaning to be rude.

We arrived at the door where the Flower Show was being held and stepped in, — into another world. Into a world where men, women and children were silent, utterly silent, reverently silent, and it was just that. They were absorbed in what looked at first like a long row of living plants, not bouquets, for some had no blossoms, all were in heavy bronze pots. It was not in the least spectacular. We, of course, were non-existent.

Each man, woman, and child, in turn, with no crowding, no word

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*Wood, Mary Cokely; Flower Arrangement Art of Japan. Charles Tuttle Company, Tokyo. Ed. 1, 1951; ed. 2 (revised), 1952.

spoken, as his turn came, bowed deeply before the first arrangement (I didn't know the term "flower arrangement" then) looked as long as he wished, bowed deeply again, passed on to repeat the ceremony before each arrangement. We, of course had no manners, or understanding but we were taller and so could pass quietly behind the silent procession until we came to the exit. It was not a large show, only about 15 or 20 pots of flowers. At the exit I turned, loath to leave. All of these spectators were getting something I missed, and I was bewildered and intrigued.

I stood at the door gazing and all sorts of questions arose. Why these heavy bronze pots? In America people put flowers, short stemmed blooms, into anything, old sugar bowls, a fancy colored vase, glass ware, old pickle jars. Then too, here were long branches of pine. We had pine branches on Christmas trees or above doors at Christmas time. Why so few flowers? Why had each arrangement a long purple drapery behind it? And why were the stems so long and not stuck down into the pot, and why were there so few in each pot? I was loath to leave. I looked down to see an elderly man half risen from his deep bow in front of an oblong bronze basin about 10 or 12 inches across and on a footed base. In it were some iris leaves, a fully opened flower, one half open, and a bud, looking as if the plant had been taken bodily from the edge of a pond. The old man had such a look of adoring ecstasy on his face that the scene was unforgettable. I was to remember that look when some other elderly man told me how his father as long as he lived would study flower arrangement and practise the art.

I think of this first flower show in Japan every time I go to a flower show in America.

The Islands of Japan, remarkable for the beauty and diversity of their volcanoes, alps, valleys, gorges, cascading waterfalls and shores, are equally remarkable in picturesqueness of the vegetation. Its plants have enriched the horticulture of most countries of the world.

It seems quite natural then, that the Japanese should have a deep sensitivity to beauty and that they should feel strongly their identification with nature. The people were sensitive to beauty because there was such an amount of it everywhere. They lived in it and had the same experiences that plant and animal life had; people were born, lived, died as did animals and plants. They saw a mountain burst into life, a volcano born, so the Japanese identified themselves with all living things; everything had life; Winter burst into Spring, Spring passed into Summer, Summer into Fall, Fall died away in Winter; just so man had birth, youth, maturity, senescence, death. Mankind was just one form of Nature. Japanese love of beauty and aesthetic appreciation of Nature have been expressed in various arts as their civilization has advanced through the centuries.

The ancient Japanese settled at Nara in the Yamato valley which was to become the "cradle of Buddhism." Buddhism came to Japan by way of Korea in 552. Priests brought the Buddhist scriptures and the "*mitsu-do*" the three holy vessels for the altar, namely a candlestick, a censer, and a flower vase, probably all of bronze. Bronze had been made and used in China for making ritual vessels (as well as for other purposes) for 2500 years, in beautiful shapes and designs. Many archaic Chinese bronze vessels may be seen in American museums today.

It is therefore quite reasonable to suppose that the "*mitsu-do*" were of bronze, because both Buddhism and bronze had gone from China to Korea and then to Japan. "*Mitsu-do*" are not petty in size and the flower vase was undoubtedly twelve or even more than twelve inches high. It was natural that this height and material should set the pattern for ritual vessels that would come after, and for the early forms of flower arrangement that would have to be appropriate to them. So was taken the first step in The Way of Flowers, the *Kado*.

Pure Buddhism always fostered the beautiful, whether in Nature, in Art, or in the minds of men. In the 200 years following 552 A. D., over 400 gorgeous Buddhist Temples were erected. During the regency of Prince Shotoku a ruler of great energy and wisdom, in the latter part of the 6th century and the beginning of the 7th, many priests and scholars were sent to China and through them Buddhist learning, culture and art were widely diffused in Japan. The devotees of the new religion brought branches of pine, and perhaps branches of other trees and shrubs as offerings to be placed on the altar. The artist priests, many of whom had painted pictures of the Deity or deities, or carved their statues, arranged the branches in bronze vases patterned after the first one. It is said that one priest, Ono-no-Omoko, who had been one of those sent by Prince Shotoku to China, was in charge and that what he did about those plant offerings was the beginning of the Ikenobo School of flower arrangement, which is still the outstanding one. The arrangements of offerings were called *Shin-no-hana* or "Flowers for the Lord Buddha."

Because the offerings were seasonal and local, that again set a pattern for the future art. The art had to make use of materials that were near at hand, as well as suitable for a bronze vase 12-20 inches high, which called for long branches. Having an innate sense of line and composition there was no thought of putting into such a container a crowded, short-stemmed bunch of flowers. Flowers, in the mind of the Japanese people, were incidental in their appreciation of Nature. The center axis of pine in these primitive arrangements rose at least 3 or more feet high. Other branches were added in an orderly fashion. This center axis rising straight up was called *shin*, or heaven, or heart, signifying the essence of living upon which all else depends. And, too, perhaps it was a symbol of aspiration wafted to Buddha, the Lord of Heaven, through the beauty of the offering.

Fig. 1. "*Shin-no-hana*" (from Josiah Conder's "The Theory of Japanese Flower Arrangement," Tokyo, 1889).

This was the style created by the early Buddhist monks for adorning the Buddhist altar. It set the pattern of using seasonal and local plant material which in this instance (as probably in all of the first arrangements) consisted of perhaps two kinds of pine and a branch or two of plum. It has a solemn dignity and set the pattern for indicating vitality by the closely united branches at the base just above the water. It also set the pattern for using bronze containers, dark and earthy-looking. The classic styles have followed these patterns to this day.

The arrangement of the whole did not give the appearance of "cut" stems, soon to die. Those artist priests conveyed the idea of unified and continuing life by uniting all the stems so closely as to give the feeling of one stem for some distance above the water which represented the earth. All branches arose from this point with the grace and freedom of nature aided by man's art. (In practice this distance might be about four inches.)

How seriously the priest, or priest-in-charge took this duty of making a *shin-no-hana* is revealed in a pretty story of one whose artistic sense had not been pleased with his results. He left the temple and was gone a long time climbing mountains, trudging along in valleys, looking for what he did not know. It was hot, it was cold, it rained, it snowed, the winds blew, but he kept on and on until at length he lay down utterly exhausted. Finally he slept and dreamed that the gentle Goddess Quannon came to him and gave him heavenly help.

How long the making of the *shin-no-hana* continued is unknown, nor is it known when the great bronze lotus arrangement such as that before the Daibutsu at Nara superseded the *shin-no-hana* of natural plant material. I asked my friend, a Lord Abbot of the ancient Shokokuji Temple in Kyoto if *shin-no-hana* were used in that Temple now. He told me that occasionally a devotee would order a floral artist to make one and would present it to the Temple but that it would not be placed on the altar but in the great hall. Such an arrangement might be 15 feet high. There was never a limit to the height except as material and good taste limited it.

It was inevitable that the building of Buddhist temples of imposing architecture and magnificent interiors should stimulate the building of palaces and great houses of emperors and lords (daimyo). As the altar was the inmost shrine of a temple, so the *tokonoma,* a specially made alcove in the reception room of the palace or home, was devoted to the exhibition of special treasures. It might contain a choice *kakemono* or hanging scroll and a flower arrangement. The *kakemono* might be a landscape or an elegant calligraphy, as much prized as a fine painting. The arrangement of course could not be a ritual *shin-no-hana,* so a style was developed called *rikkwa,* meaning built-up flowers, i. e. flowers arranged for man's enjoyment. The great difference between the two styles was one that might be called philosophical; the tip of the main stem was placed off center to emphasize this difference. Although the *shin-no-hana* was not entirely symmetrical, it was nearly enough so as to make it, as it were, fit for man's imperfect offering to the Lord Buddha. *Rikkwa* indicated identification of man with nature in the greater naturalness of art.

The basic ideas of *shin-no-hana,* however, were incorporated in *rikkwa;* namely, the use of the bronze container twelve to twenty inches high; the uniting of the stems for four inches above the water;

Fig. 2. Kaleidoscopic view of a landscape using branches of pine, loquat leaves, plum leaves and berries of *Rhodea* and two as yet unidentified plant materials in a most beautiful *rikkwa*. (*"Rikkwa"* means built-up flowers.) The rugged pines on a distant slope, the loquat leaves suggestive of a nearer lower area, and the *Rhodea* near at hand, might all be met with on a journey in mid-winter. The arrangement does not suggest "cut" branches because of the close union of stems at the vase above the water. In this *rikkwa*, which was probably at least 6 feet high, the artist has arranged his lines and voids in beautiful lines and rhythms in spite of the natural irregularity of the branches. The heavy bronze vase has an interestingly suggestive zoomorphic shape and gives a weighty earth-like base below the trees.

the height and mass proportionment of the components; the use of seasonal and local plant material. Perhaps too, at that time the reflection of the lines of the container in the main line of the plant material, inducing a feeling of greater vitality and rhythm, became more highly developed. *Rikkwa* embodied all the basic principles of aesthetic design that *shin-no-hana* had, and in a more subtle way. *Rikkwa* represents a kaleidoscopic view of a landscape and causes in the spectator an emotional reaction as if the scene were actually before him in all its seasonal beauty. The daimyo viewing a *rikkwa* had seen landscapes in which there grew all the plant materials he now beheld in the arrangement before him. *Rikkwa* used a greater variety of plant material than did *shin-no-hana*, pine as well as other tree branches, iris, narcissus, lillies, loquat, and other distinctive leaves; in fact whatever was distinctive in season and landscape, that would stand up well. Today, in looking at old books with illustrations of *rikkwa*, one knows exactly at what time of the year the arrangements were made. Maple was much used in autumn. Emperor of daimyo or mere subject sought to have the beauty of nature as close to him as possible at all times and in all places. He made gardens which copied landscapes and so he tamed nature. He wanted the faraway places close and the outofdoors, indoors.

In the preface to a book entitled *"Rikkwa Shodo Shu"* (The Right Principles of Rikkwa) the author, Jiukyu shi, says; "Truly with an inch of water and a foot of tree one produces the effect of a landscape of 1000 ri (which would be 2500 miles) of mountains and rivers. The changes in the life of trees and flowers is mirrored in the space of a *tokonoma*. I have carefully drawn these pictures of the ancient correct flower arrangement for the sole purpose of cultivating the soul."

Rikkwa was at its height in 1684. This Jiukyu shi must have been an outstanding man in floral art. The "shi" on the end of his name means what today we call a researcher. He must have devoted considerable time to collecting over 100 rikkwa designs and hand coloring them or having them hand colored. It was a hard and fast rule in flower arrangement art of the earliest period that illustrations in books on that subject should be in black and white only because "color distracts the eye from line," and line from the beginning had been an outstanding feature in all Japanese art. How much *rikkwa* is now used except on the Emperor's birthday and other cereomonial occasions I do not know.

Undoubtedly from the earliest period a twig or a flower may have been put into a vessel, either as an offering to the dead, or for pure enjoyment, and that is still done. This style, if it can be called a style was called *nagaeire* or "thrown in," referring perhaps to the lack of balance. But as time went on a third style was developed for the ordinary home. This was a simple pure style called *ikebana*, "putting flowers in water" or *seikwa*, "living flowers." Like

Fig. 3. *Rikkwa* made of maple branches only, in their fall coloring: a magnificent composition. The figure is taken from the three-volume work on *rikkwa*, "*Rikkwa shodo shu*" (The right Principles of *Rikkwa*) collected by Jiukyu shi in 1684, when *rikkwa* was at its height. This arrangement must have been 8 feet high or more and strongly reminiscent of the places in Japan where maples give gorgeous masses of color. The maple leaves, on account of their rich coloring and small size, are called 'flowers'. The odd shape of the bronze container is in full accord with the many points of the 'flowers'. The beautiful lines and rhythms were the composition of a master. Floral artists and nobles vied in making *rikkwa* arrangements.

Fig. 4. A man is seated on the floor before a small lacquer table, making an arrangement of iris. The bronze container is a cone on the crest of crashing waves, a shape much liked by the Enshiu School, and called *edobata.* A rabbit gaily jumping the waves gives a whimsical effect. This picture is from a book of illustrated poems by little known authors, published in Tokyo in 1815. The author of the particular poem is Teishi Hokuba and the illustrator Ihachi Asakura.

The poem tells the man's thoughts while he is arranging the flowers, an occupation he has greatly enjoyed all his life. He is hoping that his little son will also learn this art.

Floral art was originated in Japan by men rather than women, and was carried on by them just as our Western music has been. The great artists with few exceptions have been men though it is considered a necessary part of a woman's education. Emperors, scholars, priests, and soldiers found flower arrangement relaxing and made it a part of their artistic and intellectual life. It was even taken up as an accomplishment by some of the famous beauties of the Yoshiwara.

Shunsho, one of the great teachers, wrote: "The study of Floral Art is a necessity for every man of culture, not only to develope the vigor of his mind but to draw out the kindly qualities of his heart."

shin-no-hana and *rikkwa* this was a man's art as was Western music. The great composers with few exceptions have been men, though women as well practised the art. *Ikebana* became an integral part of home life, and also, it must be said, an accomplishment of the Yoshiwara.

It followed the basic pattern set by the two earlier styles but much more simply. Only a floral artist could command the time and the effort to make a *rikkwa*. An arrangement in the *tokonoma*, the traditional spot for *kakemono* and flower arrangement, became a family bulletin. For instance, an arrangement of pine or juniper symbolized congratulation and good wishes for the birthday child; pine, plum, and bamboo, the "three friends of winter" was the greeting for a wedding and almost an essential for the New Year's season. Every ceremonious occasion had a symbolic arrangement. Even arrivals and departures were indicated by the arrangement for the day. The social standing of a guest was recognized by his seating with regard to a flower arrangement. Each *ikebana* brought Nature to the family circle as an honored guest. The daughters of the family were taught that they were not ready for marriage until they had had some years study of the art. It was an honor too, if a good teacher took on a pupil. The teacher did not charge a stated sum for a lesson or a course, but he was paid as much as could be afforded, and a little more. The sum was carefully wrapped in a bit of tissue and slipped into the sleeve of the teacher. It has been said that a certain teacher in a suburb of Tokyo earned more by teaching flower arrangement than he earned as mayor of the town.

After completing a required course of some years a star pupil would be given certificates and prizes, one of which would be a scroll on the "Etiquette of Flowers," i.e. how to behave in their presence, as well as rules from his laboratory book, such as: "A flower should never stare at a person." Nothing connected with Japanese flower arrangement was casual or too trivial for attention.

The floral calendar determined the time of the traditional family outing once a month. The family would go to some local and seasonal display for the day. The arrangement in the *tokonoma* was suggestive of times and places. The identity of man with nature resulted in the sumbolism that permeated every floral arrangement.

Understanding the symbolism is what makes the Japanese flower arrangement appeal not to the eye alone but to the spirit as well. The pine was a sumbol of long life which appealed to the soldier because it withstood the blasts of typhoons for years uncounted, yet stood green and glowing with life. The floral art was likened to it in the hard-to-translate "*Sokwa matsu no midori*" which is, roughly, "Art that is eternally old, eternally new, eternally green, and growing like the pine tree."

Fig. 5. A print by Keisai Eisen (1789-1851) showing a famous beauty making a flower arrangement. The print is one of those entitled "Glimpses of the Yoshiwara," and this one is labelled "At the Okamoto-ya, Haginosuke." The art of flower arrangement started with the lofty motive of adorning the Buddhist altar, but became so popular as even to become an accomplishment by which the inhabitants of the Yoshiwara whiled away the time and entertained their patrons.

(Print from the collection of Mr. Henry N. Shabsin, Washington, D. C. on loan to the Museum of Art, University of Michigan.)

The bamboo may be bent but not broken and once it is rooted maintains its stand. So it is a symbol of integrity. The plum, the earliest blossoming tree of the year, blooming even in the snow, is a symbol of courage, sweetness and purity. *Ume-ko* is a common name for little girls because their mothers wish them to grow up with these qualities. Around Nara and Kyoto especially where the art of flower arrangement developed, these "three friends of winter" symbolized ideal characteristics in a way to be remembered by a sensitive people. Names of these trees were common family and given names.

I remember making a New Year's call on a Japanese friend in Nara. There were several inches of snow on the ground. We sat warming our hands over a few live charcoals in the *hibachi,* the only heat in the room. Presently my hostess said: "Wouldn't you like to see my plum tree?" "Oh, yes!" I said, thinking it was a dwarf one in bloom, a common sight at that time. She threw open the *shoji* the outside sliding doors, and there was the plum tree looking like a huge popcorn ball, with snow on the ground and green pine trees behind, — unforgettable.

The cherry is symbolic of patriotism in Japan because its petals fall before they wither. Iris is the symbol of victory with its sword-like leaves and flowers that come after spring has conquered winter. The willow of gentleness is used only when the catkins are small or the branches are leafless. Flowers are in general, less important than plant habit. Common flowers are not used in floral arrangement. The plant material used must have personality, distinction, must stand up well, and the arrangement must show the habit of growth. The appearance of life, vitality, is one of the most important features. The word *"hana"*, which we translate as flower, does not mean exactly that to the Japanese.

There is no doubt that the Buddhist flower vase sent to Japan in the year 552 set the pattern of bronze flower containers for the art for all time. Though pottery has been and is still used, and bamboo in its many shapes, yet bronze containers have proved permanently satisfying because they symbolize the earth and its life-giving attributes.

The householder as well as the floral artist needed several containers because tradition and his inbred sense of the appropriate insisted on a close harmony between plant material and container, the two together making a unit of design. What suited a morning glory would not suit a pine. One could not make an arrangement until he found a container of the type to give a feeling of outward and inward (spiritual) harmony.

There were three general types of containers, the erect, cylindrical kinds, averaging about 12 inches high, suited to a formal style; the basin types, round, oval, diamond-shaped, and rectangular; and hanging or suspended types. All of these were made in bronze, pottery or

Fig. 6. This plate is taken from *"Ikenobo sen ryu"* (The Principles of the Flower House) issued to students, in an 1892 reprint of an earlier edition, published in Kyoto where the original Ikenobo still exists.

It is a beautiful example of an arrangement of "the three friends of winter," pine, plum, and bamboo, which is traditional for the New Year and for wedding ceremonies. Pine symbolizing longevity, plum, courage and sweetness, and bamboo, integrity, have been associated through centuries but still mean as much as they ever did.

The cosmic symbolism of the earth-colored bronze container is enhanced by the design showing clouds, among which young dragons disport themselves, indicating a beautiful and auspicious day. The container is more interesting because it is footed. The arrangement has elegance and dignity. The sturdiness of the old plum branches is in harmony with the heaviness of the bronze, balanced by the delicacy of the blossoms and the crisp greenness of the bamboo.

This arrangement was made by Muto Sho-an, head of the Flower House, and was exhibited in Tokyo.

Fig. 7. An illustration from the "*Ikebana Chigusa Shu*" (Collection of 1000 plants in Flower Arrangement) published at Mito in 1903. It shows an arrangement of a "thread willow" according to precepts of the Enshiu school in a simple bronze basin ornamented with only a Greek key design. There is a rare aesthetic harmony between the *kakemono* (hanging picture) with a crane (symbol of long life) resting in what we may suppose a damp spot, with willows, appropriate for felicitous occasions.

Beiyuan a pupil of Go Sho-an (the honorable master who lives in a cottage where five pines grow) made the arrangement. The *dai* or stand on which the arrangement is placed repeats the sweeping curves of the willow, (or should we say the willow sets the pattern for the stand?). And again there is a suggestion of those sweeping curves in the grain of the wood at the edge of the *tokonoma*.

bamboo with infinite variations of shape or decoration as fancy or genius might suggest. Exact duplicates were rarely made since those artist-artizans had so many ideas waiting to be born.

If a father, when he bought his daughter's trousseau, bought her a flower container, a favorite wedding present, an heirloom-to-be, he might choose one that had a wide plate-like top on the footed bowl, called a *usubata*. It would probably have on it the figures of an old man and an old woman under a pine tree, symbols of conjugal fidelity through a long life. With these there might be the crane and the tortoise, also symbols of a long and prosperous life.

As different schools of flower arrangement arose, each showed some preference for a container of a particular shape. The *Koriu* School, established by *Rikiu*, and the later *Enshiu* school liked a truncated cone set on the crest of a wave. This was called an *edobata* in distinction from the *usubata* of the original Ikenobo school. Frequently used in summer is a basin with grasses or water plants. Many of the basin style had a footed base which varied the design. Feet and handles were often zoomorphic.

In every detail of a Japanese flower arrangement the unification of man and nature, each an important part of the universe, shows itself. The *san-sui* or mountains and water of landscapes, the plant and animal life which ministered to him and he to them, were one. A tall cylindrical vase encircled by a dragon symbolized the earth surrounded by clouds, with thunder and lightning. Slender young dragons as vase handles may mean a gentle breeze, slightly bending the bamboos, rippling the growing rice, and cooling man. Every bit of design on a bronze container has a spiritual and symbolic meaning.

Handles and feet were a definite part of the design of a container and important in symbolizing the unity of life and the universe. Both were instinct with arrested motion, extending in a rhythm from the vase outlines, throughout the lines of the plant arrangement to the heaven above.

Floral containers were never bric-a-brac. When not in use they were stored with other precious family treasures. They had only one use, to bridge between nature's beauty and man's art.

The artistry of flower arrangement extends to the *tokonoma*, in the relation of the latter to the *kakemono* and the flower arrangement itself. The *kakemono* must not be too long or too wide; the arrangement must not crowd either the *tokonoma* or obscure the *kakemono*. Then too there must be harmony of content between kakemono and the plant arrangement. If the *kakemono* is a landscape an arrangement with either blooming or non-blooming plant material is correct. If the scroll is simply beautiful calligraphy, which in Japan is as much admired as a painting, one may use almost any kind of plant material.

Fig. 8. This illustration of tree peony arranged in Enshiu style is taken from the "*Ikebana Chigusa Shu*" (Collection of 1000 Plants in Flower Arrangement), Mito, 1903. The arrangement is in an *edobata* of bronze on a stand or *dai* with curved-under ends. The receptacle to hold the water and stems is broadly conical, with clouds around the rim, and arising from a crest of waves in which a dragon is angrily thrashing about and throwing sand which sticks to the cone. It is symbolic of cosmic turmoil, in spite of which and because of which plant life thrives and produces beauty.

Peony is called the "King of Flowers" and this is a truly royal design. The basic elements of rhythm, unity, harmony, contrast, and balance are all here; the lines of the design are strong and full of vitality. One cannot take away even one leaf without destroying the unity. The broken off ends of the large branches make as interesting a part of the design as the blossoms. A magnificent arrangement by Tsubome Susuki.

Fig. 9. Another illustration from the 1892 reprint of the book entitled Principles of the "Flower Way House" (as the Ikenobo School is called). It is not on general sale but is issued to students at the Ikenobo School in Kyoto. The picture shows a naturalistic arrangement of iris, in a simple low rounded quatrefoil shaped bowl, footed, and with a conventional border design. It is probably of bronze.

The Ikenobo School advocated little bending of stems. The natural growth habit of the iris is emphasized and idealized. The feeling, not of "cut" stems but of growing material is emphasized by the realistic approximation of stems at the emergence from the water and also by the succession of gradually diminishing leaves. The arrangement talks of a spring day, and of iris growing in a pool in the sunshine.

A waterscape should be accompanied with an arrangement of plants growing in or near the water. The harmonies are all simple, natural ones.

There is a general rule that the height of the chosen material above the water line must be at least wo and one half times the height of the container. Height allows harmonious curves, and elegance of proportion, all of which must accord with the *tokonoma*.

The aim of a Japanese flower arrangement is to encompass in a single view an idealized moment of arrested growth in the life of a living plant or tree, in which it is dissociated from all that is extraneous and unharmonious, but is brought into close relation to human life. The ability to conceive such a harmony comes from close observance of Nature coupled with innate artistry, and a compelling desire to understand and project it.

Plant materials with symbolic attributes were favorites. The floral artist tried to make a perfection indoors, of the beauty which Nature had started out to make but which noisy cosmic disturbances had prevented.

That could not be done by mass, nor was color overly important. A sense of line is innate in Japanese art. Line, the path which the eye travels from one spot to another is much more interesting and revealing. The selection of the main stem of the plant material was most important. On it depended the strength and beauty of the whole arrangement as a design. It had to have vitality, dominance, force. It needed a curve, whether provided by wind or the hand of the artist. It had to have a good tip stretching toward heaven as trees and plants naturally do. Other stems or branches arising from a point some inches above the water, in various harmonizing curves, each with its tip pointing upward, repeat the theme and itensify the feeling. The symbol of earth had lines harmonizing with the heaven line. The wave pattern on so many containers was symbolic of ocean waves surrounding Japan. A dragon design encircling the earth had similar significance.

These patterns, seen everywhere in nature by the observant, have all the basic aesthetic qualities demanded by good design. The harmony of the three lines is perfect in every flowing curve and motion of each line in relation to every other. Rhythms animate the whole. Unity dominates, for without it no design is satisfying. Unity of the whole idealizes the characteristics of the plant species used, condensing much into little. The perfection aimed at does not include symmetry which speaks of completion. Nature is never complete, but ever changing, and an arrangement catches a moment during change.

But the mind of the observer does not stop then, any more than when we look at a lovely tree or shrub in nature. Prince Shotoku said:

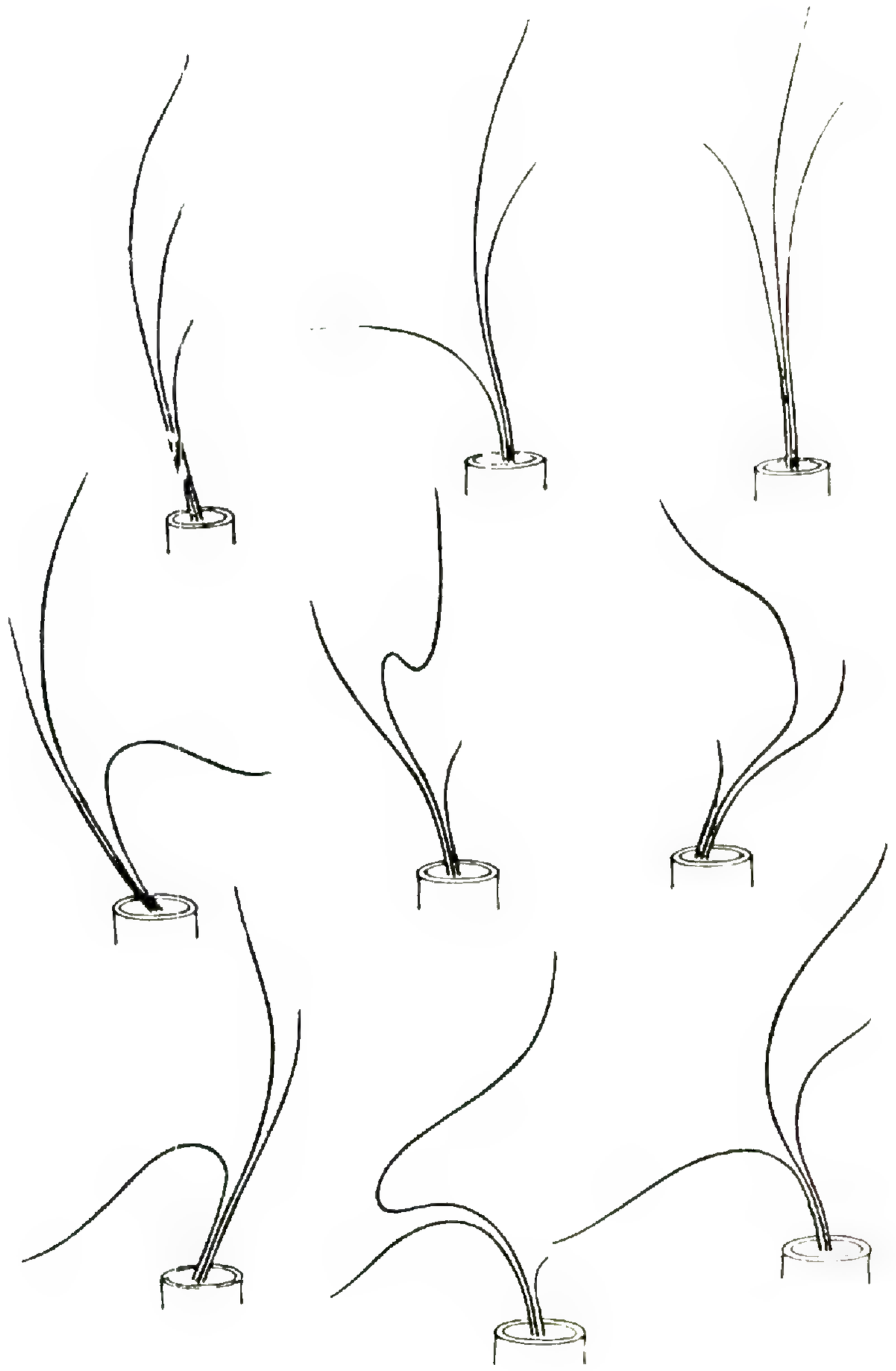
"Buddhism looks to the future," and this is the imprint put upon Japanese floral art by the Buddhist priests who originated and developed it.

The seasonal use of flowers resulted in great attention to the floral calendar. So, in looking at the old books of flower arrangement, one can tell almost the day of the month by the material used in the arrangements. The prevalent Japanese and Chinese philosophy of the cosmos conceived of two great forces called in and yo or the more familiar, to us, yang and ying. To us these are male and female. This conception was incorporated into floral art. The Japanese as well as the Chinese apply these names to all contrasts in nature and life, such as sun and moon, day and night, long and short, wide and narrow, big and little. Thus they speak of a yang stone in contrast to a ying. This conception as applied to stones is frequently encountered in their landscape gardening, which makes great use of stones. It was natural to apply these terms to flower arrangement. It seemed natural and necessary to show the contrast between the under side of a leaf and the upper, to have some long stems and some short, to include buds as well as blossoms. Floral art developed from a love of nature to an art that has its appeal not only to the eye and emotions but to the intellect. A Japanese flower arrangement was never meant to be just an eye catcher or a colorful adjunct to a room.

The logic of the art requires that we accept certain assumptions, postulates and conventions before it becomes valid to us.

The balances in an arrangement are important. The first great one is that between container and plant material; the dark heavy earth-colored bronze balances the lightness and delicacy and openness of the leaves and flowers with their variety of forms. The strength and beauty of the Heaven line balances the man and earth lines, while the man and earth lines balance each other. All of these are in balance either singly or in masses or curves. The voids must balance the angles which must be sharp angles. The ratios of the lines are mathematical, 1,2/3, 1/3. The main line 1, the man line 2/3 of that, and the earth line 1/3. A fully open flower is balanced by a bud; the fronts of the leaves are balanced by a proper number showing the backs. In many plum arrangements a heavy, trunk-like, main line is balanced by the delicate blossoms. The balances vary as the plant materials. Chrysanthemum blossoms balance the leafy stems. *Aspidistra* leaves, wide and shiny green, are much used to balance predominantly flowering or leafless branches, such as those chrysanthemums, or *Euonymus alata,* or pine. *Aspidistra* leaves are used throughout the year either alone or in countless combinations. Large curly cabbage leaves balance pine branches very interestingly.

But no matter what the materials or combinations are, there is always a pleasing and natural harmony suggestive of time and place as well as relationship. This harmony should be enticingly, excitingly



Various lineal distributions for three main lines.

Fig. 10. There are the basic patterns which every student must know and memorize in order to choose a pattern suitable for the plant material in hand. Other lines (branches) may be added as desired. In order to make a pattern with good lines, plant material must be at least once and a half the height of the container above the water line. Two and a half times that height is preferable.

Lines (branches) must be long enough to give a feeling of energy to whatever arrangement is planned. If a line, whether curved or non-curved, lacks vigor, the arrangement falls short of being an achievement. Too short a line cannot express purpose in any form of art, nor can unrelated lines. The close union of stems at the base for several inches gives vitality to a flower arrangement.

All of the traditional plant materials used in Japanese flower arrangement are adaptable to these patterns. One must remember that not all plants were used. Some common ones that were left out had no suitable characteristics or traditional symbolism, and others were considered as being actually ill-omened.

beautiful, in agreement of height, curves, color, proportion and vitality, but never casual. If differing plant materials are used such as iris and pine, the iris is never placed between the tree branches but to one side, because there is too much difference in their natures. Sometimes the harmony is very subtle. A container shaped like a frog blowing a bubble of air which forms the receptacle for the water which holds an iris arrangement may signify a breath of life.

The harmony in an arrangement is always consistent. The relationship between the curve of the heaven line and the others is repeated over and over.

In any work of art, contrast is necessary, as necessary as harmony. In a Japanese flower arrangement the contrasts are many. For instance the man and earth lines are not like the curve of the heaven line nor do they exactly imitate the line of the container. There is contrast in the materials used, pine and plum, willow and narcissus, grasses and rushes, pomegranate and pine; sharp contrasts in winter arrangements especially; angles and voids in construction; small curves in container and greater ones in the flowing harmonies of stem lines; contrasts in color, although color is not the predominating feature. The lesser contrasts among shades of green, as seen in nature, are emphasized, with occasional greater color contrasts. The two great exceptions are the maples, a favorite subject in the Fall when they are gorgeous masses of flame and green and the glorious chrysanthemums.

In old Japan cosmic rhythm dominated seasonal arrangements, as one can tell by the illustrations in old books. In Spring the arrangements are forceful, in Summer full, in Fall rich in color, in Winter sparse and lean. The seasonal rhythm was simple, was reflected early in the art of flower arrangement, and its interpretation has become traditional. So it has come about that a Japanese flower arrangement is never a bouquet for color effect nor an exhibition of horticultural perfection.

Japanese floral art with its history, its traditions, its logical system, epitomizes the universe and man's relation to it. All this can be expressed by the symbolism of the earth encircled by the dragon, representing the cosmic forces, typhoons, rain, snow, thunder, lightning, cold, and heat. The plants of the seasons, indicating the alternation of dormancy and growth, of old age and youth, the perpetual contrast in life denoted by the ying and yang; the rhythm of continuing life, expressed in repeated curves and contrasts. All this started as the *shin-no-hana*, the ritual offering on the Buddhist altar, continued through the *rikkwa*, and lives still in *ikebana* or *seikwa*, the art of living flowers.

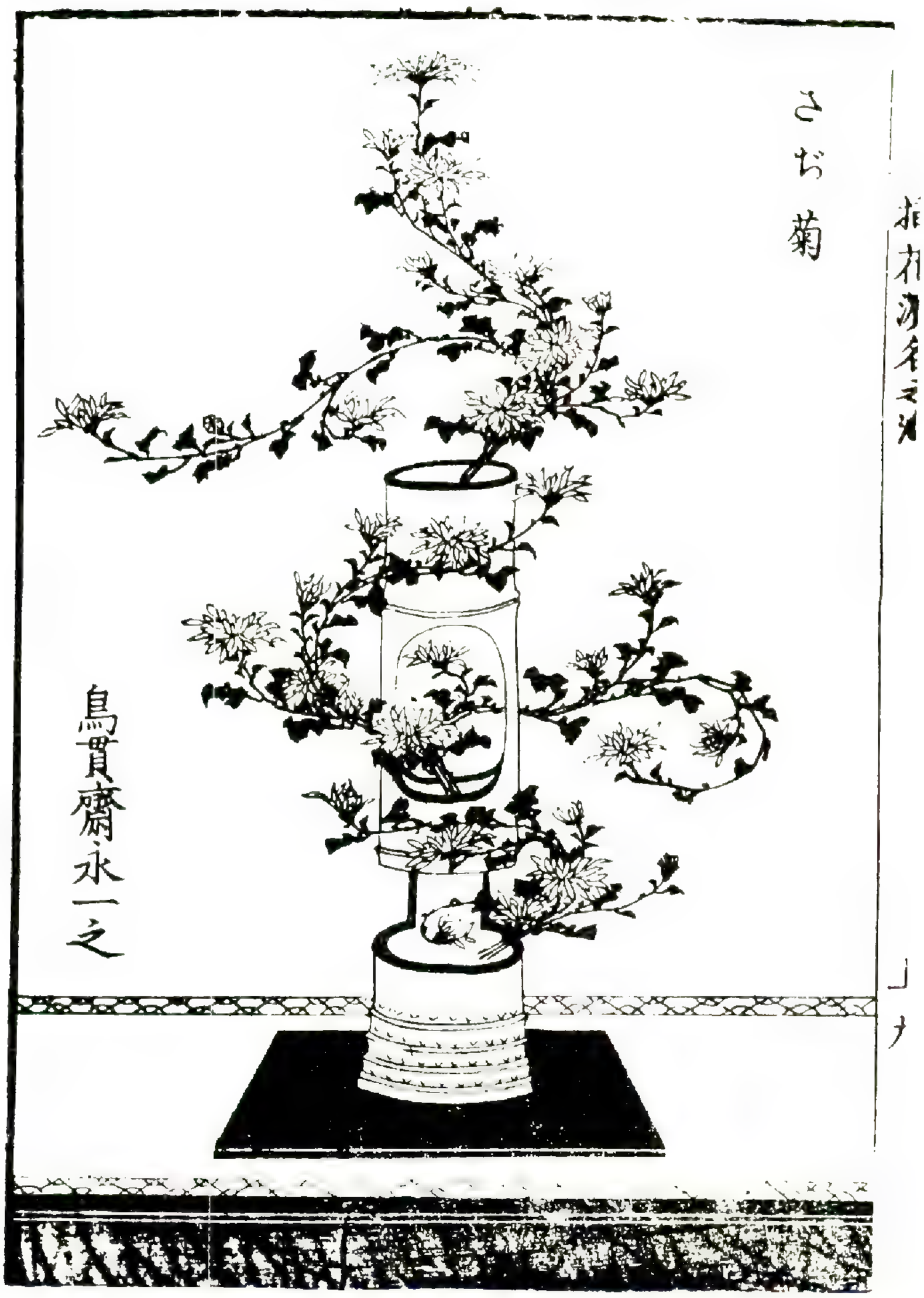


Fig. 11. An arrangement of chrysanthemums in a three-mouthed bamboo container, from the work entitled "The Lake Hamana," published by the Enshiu School in 1835. The illustrations are by Keisai Eisen a contemporary and collaborater of Hokusai and Hiroshige, and a noted landscape artist. The pen name of the floral artist is Torinuki Saiyo Iishi.

Bamboo has been used for flower containers since about 1400. It is cut into many shapes, sometimes including only the more or less irregular lower or "root" portion, but often, as in the example shown here, having "root" joints only at the bottom. The basal, shortened joints placed in their natural position give a certain feeling of upward flowing grace, regardless of the plant material of the arrangement. The "*dai*", a plain black lacquered board harmonizes with the facing of black lacquer of the *tokonoma*.

The beautiful rhythmic curves and grace of line idealize and unify the multiplicity of leaf, bud, flower and stem elements so well that nothing can be subtracted without a loss. The balances and contrasts are equally composed so that the arrangement as a whole is completely satisfying.

REAL VALUES

E. D. Merrill

There are those well-known days when everything goes wrong, and they by no means always fall on "Friday the thirteenth." August 25, 1917, was such a day in my career. Having been domiciled in Manila for the preceding fifteen years working on various botanical problems, I had long since realized that the special characters of the Philippine flora could not be properly understood without reference to the vegetation of the surrounding areas. Gradually our field work was extended outside of the limits of the Philippine Archipelago to such obviously related regions as Borneo to the southwest, to the Moluccas directly to the south, to the Marianas Islands to the east, to Indo-China to the northwest, and to southeastern China.

In 1917 I had an opportunity of making a second botanical field trip in Kwangtung Province which was too good to miss. A group of missionaries, mostly residents of Canton, had organized a summer camp on Lo-fau-shan, the highest mountain in eastern Kwangtung, about ninety miles northeast of the city. Mount Lo-fau, its upper slopes in part well wooded, had previously been explored only in a sort of desultory manner. True, I had only my annual vacation of one month available for the jaunt, but if I made reasonably good connections it was clear that I could count on about three weeks time in the field and still return to my Manila office within the limits of the time available. Here was a real opportunity to do a considerable amount of botanical exploration and at the same time train certain staff members of what is now Lingnan University in field methods.

The summer camp was very pleasantly located near the lower limits of a forested area on the southern slope of the mountain, with a considerable amount of interesting terrain readily available. The camp was a mat-shed community, that is, the shelters were of strictly temporary construction with light frames, the walls made of mats, and the roofs thatched with palm leaves. On pleasant evenings it was customary for the personnel of the camp, about forty individuals, to gather around a bonfire on a flat ledge near the camp from which one had a magnificent view over the broad valley to the south. On the evening before our bandit experience I had been asked to entertain the assembly with an account of such adventures as I may have had in the Philippines. I must state frankly that there was little which might be construed as wildly exciting in those adventures, so that I am afraid that the evening was a rather dull one for my listeners.

They included various arduous overland trips, mountain climbing adventures and routine exploring expeditions of one type or another, but normally there was little that might be interpreted as other than normal occurrences for those who, like myself, were intent on prosecuting field work in natural history. True, there were adventures in fording swollen rivers, some chances taken in landing on open beaches through the heavy surf, weathering a severe typhoon in a seventy-five foot launch, sleeping (the term used advisedly) on the summit of a high mountain during a raging typhoon, and other items of this nature. On one expedition in the Bataan Peninsula I inadvertently ran into a much-wanted *ladrone* who had established his hide-away camp in a remote and densely forested river valley which was distinctly difficult of access. But even here the *ladrone* was much more disconcerted than we were, for when we again visited the site the following day he had decamped. On another occasion I had the rather gruesome experience of botanizing among the bones of the defenders of Bud Dajo. This was a few weeks after that mountain stronghold of dissident Moros in Sulu had been reduced. The trenches excavated along the rim of the ancient crater for defense purposes had been used for the burial of somewhat more than 1000 bodies of the slain defenders, but in places the tropical rains had eliminated much of the covering soil. Then there were experiences such as getting separated from one's food supply and being obliged to subsist on what food one can secure in a tropical forest, which in quantity and quality is nothing to write home about. I still remember my companion's comment on the occasion of the 1906 Thanksgiving dinner following our ascent of Mount Halcon, when we had exhausted our food supplies, which festive meal consisted solely of two broiled wood rats each and some boiled fern tips. The comment was: "Cheer up, you couldn't buy a meal like this at Delmonico's." It is some consolation that on the basis of the skins and skulls of these edible rats a new species was described, the specimens now preserved in the National Museum. On this same ascent we had previously consumed what must have been the grandfather of all the monkeys in Mindoro, a memorable feat in itself, because of the toughness of the flesh.

Such were the wild adventures of fifteen years in the Philippines. After all, these were of more or less casual occurrence in such a country as was the Philippines four or five decades ago. They were matters to which we, who were prone to get into the out-of-the way and not easily accessible places, gave little attention, for on such trips one could never foresee what might happen.

As intimated above, everything seemed to go wrong on the memorable day at Mount Lo-fau. After attending to what needed to be done in camp, including taking care of the partly dried plants which were in the presses, I descended into a deep narrow valley for somewhere between 1000 and 1500 feet, in the hope of finding some plants of

sufficient interest to warrant their collection, but in this I was disappointed. The valley proved to be a very sterile one, such scant vegetation as was present, mostly grasses, being composed of species of very wide and common occurrence, so that I returned several hours later almost empty-handed. About all that I now remember was the long climb up the steep open slopes on a hot, dry day. I had secured very little for my pains and exertions, as not infrequently happens on collecting trips. I had taken care of the very few plants that I brought back, and was relaxing in anticipation of luncheon, when I heard someone exclaim, "the drying house is on fire." This was a palm thatched shed where we kept the botanical presses on racks over a slow fire to expedite the actual drying of the specimens. The loss of the collecting equipment would have been serious, as there was no local source of supply for the necessary replacement papers. We did succeed in throwing out the presses and supplies before the fire reached them, and so ended the little diversion, caused by the fire,— but the drying shed was a total loss.

The dining hall was supervised by Miss A. Hancock, and it so happened that the date of our adventure was her birthday. Because of her efficiency in seeing that the daily food requirements of about 40 people were well taken care of, not an easy task when most of all supplies had to be brought in by carriers from Sheklung and Canton, it was decided to serve a surprise dinner that evening in honor of her services. I was asked to take her out on a botanical expedition and not to return until dinner time. (We were not fated to get back until considerably after that important hour!) Accordingly, we planned a trip over the top of the mountain to the north in the direction of So-lio-koon in which village lived the contractor who had constructed the camp, and who was due to receive approximately 1,000 silver dollars for fulfilling his contract. Immediately after luncheon we started out, our party consisting of Miss Hancock, Professor Levine, myself, and one Chinese coolie. We knew that there were plenty of bandits operating in the regions, but we had had no difficulties with them, nor did we anticipate trouble this time: we were unarmed.

About three miles from camp while we were travelling single file along a trail down an open narrow valley, suddenly there was a volley of rifle shots, with bullets whizzing overhead. Levine casually commented, "Somebody must be out hunting." But as he spoke came another volley, the bullets splashing on the rocks in our immediate vicinity. It immediately became apparent that we were the hunted, and that there was trouble ahead. In order to reconnoitre with safety, we threw ourselves down behind some boulders on the slope below the trail and surveyed the scene. Everytime we showed our heads above the boulders came another volley of shots, some unpleasantly close. The pattern became evident, for on a ridge, fortunately perhaps a thousand feet distant, were nine bandits, each armed with a rifle, and

each apparently quite willing to expend any, or all, of us. Fortunately they were by no means expert shots, and the distance was so great that we had time to dodge behind our individual boulders before the bullets arrived, the give-away being the puffs of powder smoke. This intermittent, one-sided warfare continued some time, until the bandits felt sure that we were unarmed, and that they could approach much closer with impunity. This they did by moving in to a smaller subsidiary ridge not more than 300 feet from where we were: one had to be a quick dodger to escape getting hit at this short distance. Matters looked distinctly serious, for there was little that we could do. Fortunately, the bandits were close enough so that we could talk with them, and again fortunately, Miss Hancock spoke Cantonese fluently. After a certain amount of palaver back and forth, we gave ourselves up, rifle fire having ceased.

The immediate demand was a ransom of $1,000 Mexican silver, — after all not a very flattering amount for four captives. We argued the case through Miss Hancock who acted as interpreter. I assure you that when a wild-eyed bandit pokes a loaded rifle in the pit of your stomach with his finger on the trigger and demands in a language that you cannot understand except through an interpreter, "a thousand dollars immediately or I'll pull the trigger" it gives one a sort of hollow sensation in the pit of said stomach. We continued to argue that they could not expect the missionaries, school teachers and botanists had that much money. The demands became more and more insistent. In proof of our assertions that we were impecunious we turned our pockets inside out, in the course of which I was relieved of an Ingersoll dollar watch. Incidentally, an experienced explorer never takes an expensive watch on trips of the kind I was addicted to. We kept no funds in the camp for the simple reason that we knew that this would not be safe in a country overrun by bandits. Our camp funds were deposited in the Sheklung bank where they were reasonably safe. The arguments continued, insistence on the unflattering ransom being repeated over and over again, and we countered that we didn't have any money. Time passed, all of us were more than uncomfortable, and no solution was in sight. It then occurred to me that I did have a cache of small change in camp amounting to about five silver dollars, which I had taken in with me for minor emergency purchases. With the thought of a possible way out I mentioned this small fortune, and finally the bandits agreed that I would be permitted to return to camp, distance about three miles, to bring the small change, but they insisted on holding the other three as hostages.

I suspect that I broke the Lo-fau-shan records as to speed for the three-mile course over the top of the mountain and down to the camp site, where I reported what had happened. There I got my five dollars (Mexican) and started back. Fortunately I didn't have to return the entire distance, for the bandits with their hostages had followed the

trail back some distance to an old ruined temple near the summit of the mountain, where I met them. In the meantime a sort of truce had been arranged, and through the interpreter various and sundry matters were discussed. I turned over my five dollars, a total loss, as I couldn't put the item on an expense account, we were each presented with an empty brass cartridge, contents of which had been expended in our direction, and permitted to depart. It was late in the afternoon, we were still perhaps two miles from camp, it was getting dark, making it very difficult to keep to the trail, and to cap the climax rain commenced to fall in torrents, so that we were quickly drenched to the skin. We eventually reached the comparative safety of camp, and, perhaps stimulated by the adventure, greatly appreciated the surprise banquet which had been prepared for the occasion.

The explanation was simple enough, but in the rather wild excitement we didn't think of it at the time. The Chinese contractor who had constructed the camp lived in So-lio-koon, and he had $1,000 due him for fulfilling his contract; we were travelling the trail from our camp towards So-lio-koon; Levine and myself were dressed in khaki, Miss Hancock appropriately for the trip, and of course the coolie was in coolie costume; at the distance of 1000 yards when we were intercepted by the bandits, they reasoning that there was the contractor being guarded by two soldiers and accompanied by his servant, and it didn't matter at all if they succeeded in disposing of the soldiers provided they could capture the contractor. Reasoning a bit further they could hold the contractor, if they captured him, for $1000 ransom, even if he didn't have that amount with him, all of which explains the unflattering valuation placed on our group of four persons. When they discovered that our party did not consist of the Chinese contractor, his servant and guards, they were probably more disconcerted than we were, but I'll frankly admit that for one, I was very thoroughly disconcerted while the shooting was going on. They simply have to save face and carry the demand through, for they knew that there might be serious future trouble for them.

The occurrence was immediately reported to the British and American consuls in Canton, and two days later Chinese troops were out in force, but of course by this time the bandits had all been transformed into simple farmers, as they were in the beginning, nobody in the region knew who they were, and so the punitive expedition ended.

In later years, when perhaps I commenced to think that because of certain important positions I later occupied I was a very important individual, before permitting myself to be overcome by my importance, I remembered the ransom demand. One doesn't have to use higher mathematics to determine actual values if one can divide the combined price of an Ingersoll dollar watch, plus five dollars in Mexican silver by four, for this would figure out at somewhat less than one dollar

each, United States currency, per person. Either our real values were low, or, on occasions an Ingersoll dollar watch may have a valuation of nine hundred and ninety five dollars (silver). Whichever way one figures it, the result isn't over flattering. We estimated that perhaps the bandits reimbursed themselves for what the cartridges expended upon us may have cost them, for most fortunately for us they were far from expert shots, otherwise this simple tale of real values might not have been told. And so the story ends, a demonstration of the real value of one missionary, one teacher, one botanist, and one Chinese coolie, a total of one Ingersoll dollar watch and five dollars in Mexican silver.

DEATH OF FRANK C. GATES.— His many former students and other friends have been shocked to learn of the death of Dr. Frank C. Gates at his home in Manhattan, Kansas, on March 21, 1955. He had been in excellent health, had conducted his classes as usual that day, and was stricken very suddenly a few minutes after returning home.

Frank Caleb Gates was born September 12, 1887, the son of a Great Lakes ship captain. He received his A. B. from the University of Illinois and his Ph. D. from the University of Michigan. During the summer of 1911, as an agent of the Michigan Geological and Biological Survey, he did his first ecological work in the Douglas Lake region of Michigan, in the vicinity of the then two-year old University of Michigan Biological Station.

After three years in the Philippines, Dr. Gates returned to the Biological Station in 1915. Here he continued to teach plant ecology through the summers with the rare personal experience of having witnessed the changes wrought by lumbering, fire, and natural succession. After three years on the faculty of Carthage College, he served as acting assistant professor of botany at the University of Michigan, 1919-1920, before going to Kansas State College, where he was Professor of Taxonomy and Ecology at the time of his death.

Known as an authority on poisonous plants and on the vegetation of Kansas and Michigan, he wrote many articles and reports, both popular and technical in nature, including his *Field Manual of Plant Ecology* (1949), which was based on his Douglas Lake course. He was active in several scientific societies, particularly the Ecological Society of America, which he had served as president and for which he did a great volume of work toward compiling the cumulative index to *Ecology*. — E. G. Voss.

A STUDY OF MAHOGANY

F. Bruce Lamb

The mahogany tree first came to my attention during World War II while I was on an assignment with the Rubber Development Corporation in the Amazon Valley. One of the Brazilians working with us on the rubber program was a botanist, Ricardo Froes, who had previously worked with Dr. B. A. Krukoff on his collecting expeditions in the Amazon. Froes was an ardent collector and student of the Amazon flora. On one of his field trips to the Rio Tocantins in eastern Pará he found and collected herbarium material of the mahogany tree (*Swietenia macrophylla*). Previously this tree had not been identified east of the Rio Machado in western Matto Grosso. Later Froes also found mahogany on the Rio Xingú. His description of mahogany logging operations in the Acre Territory of Brazil and the significance of this extension of the known distribution of the tree thoroughly aroused my interest.

Consequently when, after the war, Professor D. M. Matthews offered me a position with the Puerto Rico Industrial Development Company investigating sources of timber in the Caribbean area for industrial use in Puerto Rico I was more than eager to go.

My first assignment from Puerto Rico in June of 1946 was to investigate a large forest property in Santo Domingo which was reported to have rich virgin stands of mahogany. Plans were made and I went ahead to Ciudad Trujillo where I made headquarters at the beautiful resort hotel, the Jaragua, which was in fact the only place where foreigners were allowed to stay. The area to be investigated was out on the eastern tip of the Seibo Peninsula, and I had been instructed to meet a guide at the little town of Higuey which could be reached by bus. Arrangements were finally completed and I started off in a dilapidated old bus that hardly appeared capable of making a trip around the block. It had a full load of passengers plus baggage and considerable livestock. It soon became evident that I was a rather unusual passenger. At every crossroads the bus had to stop while a policeman checked on the *extranjero* to be sure I hadn't given them the slip somewhere. As soon as my presence was verified we were always waved on.

It took the whole day to make the 75-mile trip to Higuey. On our

arrival late in the afternoon I located a *pension* and then started to hunt my guide. No one knew him by the long formal name I had been given. However, he was finally located in a small bar and, after a preliminary drink to cover the formalities, arrangements were made for the remainder of the journey by mule.

We decided to start as soon as we had eaten, since it would be a moonlight night. I returned to the *pension* to eat, get my gear, and await the arrival of the mules. My guide, in addition to getting the mules, had to report his expected movements to the police.

Our moonlight ride in the cool evening was a slow pleasant jaunt along country lanes, interrupted several times when we reported our progress to local politicos to be relayed back to the authorities. As the moon was setting about midnight we reached a small hut and hung our hammocks for a rest until sunrise.

At sunrise we had a tortilla and coffee breakfast and proceeded on our journey. The trail now led through uninhabited, rough, limestone country that only a mule could navigate. The growth was short, scrubby dry forest, and I began to have serious doubts about the worth of my mission. As we approached the sea coast the vegetation improved somewhat and we saw a few small mahogany trees, but nothing to justify the trip. A combination of meagre rainfall and shallow soil underlain by porous limestone had produced a site that supported only xerophytic vegetation — a virgin tropical forest, yes, but one with no commercial timber whatever.

Further investigation showed that mahogany was available in limited quantities in Santo Domingo but would be very difficult to obtain because of tight government control.

I continued on to Cuba to determine what, if anything, could be done about the embargo placed on the export of mahogany that had recently eliminated Puerto Rico's main source of supply. After meeting in Havana with representatives of the Cuban lumber manufacturers' association and various individuals interested in exporting mahogany, I found that there was not enough mahogany left in Cuba to supply the local demand. The embargo was established to protect the local wood-using industries.

At a meeting of the lumber manufacturers, James Cortada of the Commercial Section of the U. S. Embassy suggested that if mahogany was so scarce where it formerly had been abundant, perhaps it would be a good idea to plant it. Immediate interest was shown in the idea but no one present, including myself, could answer the questions that followed regarding costs, yields, and suitable growing conditions; and

I left that meeting determined to investigate the problems involved in growing mahogany.

Since no reliable source of badly needed mahogany was found in Santo Domingo or Cuba, it was decided that I should make a survey of sources in Central America. On a three-month trip from Mexico to Colombia in the fall of 1946, it became evident that even in Central America mahogany was not an easy item to obtain. Procurement procedures involved the advancing of large sums of money to logging contractors whose reliability was difficult to determine, and logging operations where mahogany remained were in extremely isolated locations and the risks were high.

All of this stimulated my interest further in the possibility of growing mahogany in plantations or managed stands. While spending parts of 1947 and 1948 with a firm of Consulting Forest Engineers in Portland, Oregon, studying aerial mapping and the possibilities of tropical applications, I began to make serious plans for a complete study of the mahogany situation. Dean S. T. Dana of the School of Forestry and Conservation at the University of Michigan

The strangler fig attacking a mahogany tree in the forest of Darién, Panama.

encouraged me to undertake the study as a doctoral research problem at the University.

During the summer session of 1949 I worked at Michigan, with Professor H. H. Bartlett, laying the ground work for a field study by surveying the literature on mahogany. Toward the end of the summer a Travel and Maintenance Grant for work in Central America from the Office of Education in the Federal Security Agency, and a fellowship at the Inter-American Institute of Agricultural Sciences in Costa Rica made it possible for me to embark on the field study.

After leaving New Orleans late in August our first stop was Guatemala City. Here my wife and daughter made headquarters while I went further afield, a custom we followed in each country visited during this year of study. Arrangements were made first to observe the United Fruit Company forest nursery and planting program at Tiquisate on the Pacific Coast, where Almyr Bump, manager of the Tiquisate Division, put the facilities of his modern plantation at my disposal during an informative two-day visit. The planting of forest trees had begun here three years earlier in an attempt to utilize land that had gone out of banana production because of deterioration and to improve forest holdings that were not suited to cultivation. During the first year, until nurseries could be established, wildings of cedar, mahogany, and primavera were used for planting stock with some success. Several problems in the control of gophers, termites, and leaf blights brought out the complexities to be faced in dealing with planting programs in the tropics.

Sr. Sargastume, Chief Forest Inspector of the Guatemalan Forestry Department, took me on a tour of the government forest nurseries supplying planting stock for government and private planting programs. Visits were also made to the private plantings of Owen and John Smith at Guatalón and Lind Peterson at Escuintla, all of whom furnished valuable information on problems and costs of establishing mahogany plantations.

Through Dr. L. R. Holdridge, cacao specialist from the Inter-American Institute of Agricultural Sciences, I met Jorge Ahumada of the Guatemalan Development Institute, INFOP. He asked me to submit a proposal for a forest survey of Guatemala, the results of which would be incorporated in a general plan for the development of the country's natural resources. After a conference with Dr. Holdridge and Dr. Ralph Allee, Director of the Inter-American Institute of Agricultural Sciences, a proposal was submitted to INFOP for a survey of the forests of Guatemala. This project opened up unexpected opportunities to study the mahogany-producing forests of Petén, Guatemala, and also provided much needed funds to cover the expense of

extensive field work. However, approval was delayed until late November.

Meanwhile I was fortunate in meeting in Guatemala Dr. V. C. Dunlap, Director of Research for the Tela Railroad Company, a subsidiary of the United Fruit Company in Honduras, and arranged to visit the nurseries and forest plantations in Honduras in company with Dr. Holdridge. We spent a valuable week in Honduras observing various phases of the United Fruit Company's extensive forestry program and enjoying the gracious hospitality of various members of the staff. Of great interest was our visit to the Lancetilla Experiment Station and Plant Introduction Garden at Tela. Here we made the acquaintance of various exotic tropical fruits from Asia, such as the delicious mangosteen, the rambutan, the pulasan, and the doubtful durian which tastes good if you can get it past your nose. Probably nowhere else in the western hemisphere could one taste all these fruits. The work at Lancetilla was begun many years before by the noted plant scientist, Dr. Wilson Popenoe. We met Dr. Popenoe on this same trip at Zamorano, where he is head of the Escuela Agrícola Panamericana, and enjoyed with him a stimulating discussion of Latin American forestry problems.

From Honduras I went to Nicaragua where Modesto Valle, head of the newly organized Forest Department, accompanied me on visits to several government forest nurseries established to provide growing stock for private planting programs on the Pacific side. A trip was also made to Bluefields on the Atlantic coast to see the Cukra Development Company mahogany plantations on the Río Escondido and to visit the Cooperative Agricultural Experiment Station at El Recreo where experimental plantings of mahogany had been made. At Bluefields when I needed some dollars changed to cordobas I was amazed to have the money changer state a preference for personal checks over traveler's checks. I hadn't even taken a check book with me so he finally cashed the others. Personal checks could be sent out of the country by mail for U. S. purchases without going through the established government import channels, and so were at a premium.

Several old-time mahogany loggers live in Nicaragua, and I learned a lot about early logging operations from such men as Philip Martínez, Eduardo Canteiro, and Robert Hooker. All these men gave me information regarding the mahogany planted by the G. D. Emry Company in the 1890's and cut in the 1920's. Unfortunately, no specific data on these early successful mahogany plantings could be found and no trace of them could be located in the field.

On completing the field work in Nicaragua I returned to Tegucigalpa, Honduras, and called Guatemala on radio telephone to determine the

Large mahogany log at river-bank log yard on Río Sabana, Panama, being inspected by the author. Beautifully figured wood is generally obtained from plank buttresses like those shown here.

cause for the delay on the proposed forest survey. After a most frustrating garbled conversation in Spanish with Sr. Ahumada in which the wave length had to be changed several times in order to get through at all, it came out that our original proposal had apparently been lost in the shuffle between the various government offices that had to approve it. I radioed the Institute in Costa Rica to airmail extra copies to Guatemala so that Sr. Ahumada could expedite the approval, and I took off for Costa Rica to make preparations and final arrangements for the survey.

It was the end of November before all the details were arranged and I arrived in Guatemala City to organize the forest survey. A telephone call to INFOP the day I arrived brought the response that I should take a few days to rest up after my trip. However, after waiting for two months for approval of the project I was extremely anxious to get started without delay, especially with the dry season, best time for the field work, only a month away. My insistence on prompt action brought Leopoldo Zeissig around the following day to our *pension* to discuss arrangements. Sr. Zeissig was extremely helpful throughout the project, but his guidance was especially valuable in setting up working arrangements with the Department of Forestry in the Ministry of Agriculture, the Cartographic Department in the Ministry of Public Works, and other government agencies. Complete cooperation was given on all sides.

Valuable information on the past development of mahogany and cedar logging operations in the Province of Petén was obtained from former members of the Forestry Department. The personnel of this Department and their equipment, which included airplanes on loan from the Air Force, were put at our disposal by Ricardo Lavagnino, head of the Department of Forestry.

The Cartographic Department made an unusually valuable contribution by opening to us their map and aerial photographic files which contained complete photographic coverage of the Province of Petén and a forest type map made up from these photographs. They also put their office space and valuable equipment at our disposal. Bert Mason, Jr., photogrammetrist from the Kendall B. Wood, Consulting Forest Engineers organization of Portland, Oregon, arrived early in December to undertake the interpretation of the aerial photography.

The study of the aerial photographs turned out to be a fascinating phase of the project. Our first examination of them showed that they would be extremely useful in planning the field work and several features stood out that we wanted to investigate on the ground. We were looking for features that would help us classify the vegetation into types or associations, and characteristics that might make possible the identification of individual species. From the first we noted that on some of the photographs certain individual tree crowns stood out white on the dark background of the other vegetation. Further investigation showed that these white crowns were concentrated in certain areas and were most prominent in pictures taken in March or April. Further investigation uncovered two lines of photography taken at different times of the year covering the same area near Uaxactún. The white crowns that interested us showed up on the line taken late in March, whereas photographs taken in early January of the same area showed nothing unusual. Since there was an airport at Uaxactún

this area was one that could be investigated.

Based on accessibility and interest from the standpoint of vegetation seen on the photographs, four areas were chosen for ground studies that would contribute the most to our knowledge of the timber resources of the area. Uaxactún and Paso Caballos were chosen as centers of field operations in northern Petén; La Libertad and Poptún for central and southern Petén.

Sr. Zeissig located a chiclero who had been all over Petén to serve as a guide. José Galeano proved to be a resourceful and experienced bushman, capable of following a compass bearing with very few references to the instrument and able to live off the bush with a minimum of supplies. Though without formal education, he had an intuitive understanding of the job to be done and was always interested in trying to learn and understand, rather than ridiculing procedures he did not see through.

At Uaxactún, our first center of operations, we found a chicle-gathering center in full swing. Daily, several mule trains would leave with supplies for the producing camps and return loaded with blocks of chicle. As soon as a loaded mule train approached the village a bugle was sounded and everyone in the little town turned out to help unload the mules so that they could be relieved of their burdens as soon as possible to rest for the next trip.

We did our sampling of the vegetation along established trails leading from Uaxactún, and our work took us to several chicle camps. In some ways these men lead a rougher life than a caucho cutter in the Amazon.

We found the Maya ruins at Uaxactún, where twelve years of excavation and restoration by the Carnegie Institution of Washington had ended in 1937, so grown up again with vegetation in 1950 that one could hardly tell from casual observation that any work had been done there. During my travels in Petén I talked with several of the laborers who had worked on the excavations at Uaxactún and it was the consensus of opinion that the work was done in search of buried Mayan treasure. Many were sure that it had been found and smuggled out, and I never got far with my arguments that the excavations and other studies were made solely in search of knowledge. In this connection Morley's comment in *The Ancient Maya*, p. 325, is of interest. He states that two small fragments of gold found at Copán are the only pieces of gold or of any metal ever recovered from an Old Empire Maya city.

I approached the work around Uaxactún with a great deal of anticipation. Professor Bartlett, who had collected in the area while work-

ing with the Carnegie Institution of Washington in 1931, first aroused my interest in this area during a class in systematic botany in 1938. Preparation for the field work in Petén, which included a study of the Carnegie publications and interviews with Carnegie people still in Guatemala, further heightened my interest.

Entering Petén by plane from Guatemala City, we avoided much of the intrigue that was reported to have surrounded Professor Bartlett's work because he had entered Petén from British Honduras, the only logical point of entrance at that time. Like the excavators, he was suspected of all sorts of ulterior motives from making surveys for rubber plantations to taking out fabulously valuable plant material. The Guatemalan authorities even went so far as to plan to seize his collections at the border as he departed.

We became involved in a somewhat similar situation in getting to La Libertad, our second field survey area. The plane took us from Uaxactún to Flores, the capital of Petén, whence we hoped to drive with the head of the Petén Forest Department, Francisco Solano, to La Libertad. On our arrival at Flores we found that the only means of conveyance was a truck with no driver. It was suggested by the owners of the truck that I drive, and since there appeared to be no other way of avoiding a serious delay in our schedule I consented.

Mahogany logs in forest log dump being loaded on trucks to be transported to river bank during dry season.

On arriving at La Libertad we drove up to the police station on the village square. Almost before the usual formalities were completed the police sergeant asked to see my driver's license. Of course I had none valid in Guatemala, and Sr. Solano had to step in and inform the police sergeant that I was on a government mission and did not need one. This did not seem to be a very satisfactory answer, but the police sergeant said no more.

We located a local driver, with a license, to drive us to several places of interest on the large savanna near La Libertad. Just at dusk we arrived back in town and found an urgent telephone call from Flores for Sr. Solano. Word had come that the Minister of Agriculture and a Government delegation from Guatemala City was expected in Flores early the following morning. This meant that Solano had to return to Flores immediately to prepare for the delegation. The only means of transportation was the truck we had come in. I wanted to spend the following day studying the vegetation around the edge of the savanna and then return to Flores in time to meet an Air Force plane that was scheduled to take us to Paso Caballos a day later. It was decided that Solano would take the truck to Flores and send it back for us on the following day.

After spending the whole of the next day on the savanna we returned to La Libertad to find no truck. Calls on the hand-grinder telephone to Flores brought no response. Finally after more than an hour of intermittent ringing we got the Flores operator. However, it was obvious from his conversation that he was in no condition to understand us, so we started to investigate the local transportation situation more thoroughly.

We found a Jeep owned by the partner of the logging contractor who had loaned us the truck. We were welcome to use the Jeep if I would drive, for the owner had been unable to get his driver's license approved because of his expressed disapproval of the government policy to subdivide Petén. This Jeep would have been the answer to our transportation problem had not the police sergeant refused to let it leave town without a licensed driver, and there was none! All of my expostulating about the necessity of being in Flores to meet an Air Force plane the next day was to no avail.

Again we tried to get Flores on the crank phone. This time the operator was more coherent and I made him understand I had to speak to Solano, head of the Forest Department. After a long delay he informed me that Solano could not be found and probably was not in condition to talk anyway. He also informed me that the telephone was shutting down for the night. This seemed to bring us up against a dead end.

Large defective mahogany tree (center), Darién, Panama. Note abundance of palm (*Sabal* sp.) and the large quipo tree (*Cavanillesia platanifolia*) at right.

We were making preparations for the 15-mile night hike in to Flores when we heard a motor approaching from the savanna. In a few minutes another Jeep drove up and stopped in front of the only eating place in town. An Army Colonel got out. After taking care of the usual formalities we discovered it was Colonel Cassasola returning to Flores after installing a light plant for the Government at the village of Sayaxche. He would be glad to take us to Flores with him as soon as he had something to eat. Without taking leave of our police sergeant, we returned to Flores and found that our former companion had been too engrossed in political affairs to remember to send the truck back for us. He had recovered enough by the time of our arrival

to be fairly coherent and to give us a colorful review of the political rally.

The next morning was foggy and we did not expect the plane to arrive very early to fly us to Paso Caballos. However, at about eight o'clock, we heard the drone of the motors as the plane circled in search of an opening through the heavy mist. We rushed our gear and supplies out to the airport to meet the plane when it got down. We took off immediately under the heavy fog and flew at tree top level in competition with the parrots — reminding me of our jungle flying in the Amazon during the war.

We found the forests north of Paso Caballos of great interest, ranging from recently burned-over land to high forest. On the Paso Caballos-Carmelita trail were some of the most magnificent mahogany trees I have seen anywhere.

The next center of operations was Poptún in southeastern Petén. Our plane came within an ace of cracking up when it headed, almost out of control, for brush along the edge of a rough narrow field while landing at Santo Toribio, an intermediate landing field between Flores and Poptún. While we circled, prior to landing, the pilot pointed out as yet unexplored Maya ruins on the hilltops nearby.

The Poptún pine savanna provided unusual opportunities for studying the ecological relationships of mahogany in the transitional vegetation between savanna and high forest, and for comparing forest conditions on the ground with those observable on aerial photographs. Field trips took us to the villages of San Luis and Pusilhá where the effects of the hurricane of October 4th, 1945 were still visible. When the studies at Poptún were finished we returned to Guatemala City, going by truck over the 70-kilometer Poptún-Cadenas road, by launch from Cadenas on the Sarstún River to Livingston and Puerto Barrios, and from Puerto Barrios by plane to the capital.

This ended our study of the forests of Guatemala and in late April I returned to Turrialba, Costa Rica to collaborate with Dr. L. R. Holdridge, who had surveyed the coniferous forests of the mountainous areas, in writing the report on the forests of Guatemala which was transmitted to the Instituto de Fomento de la Producción in Guatemala, with copies going to the Institute in Costa Rica and the Pan American Union in Washington.

In July I flew to Changuinola, Panama, to see a small 25-year old mahogany plantation established by the United Fruit Company, and on to Panama City to visit the Canal Zone Experimental Gardens at Summit and to observe the new Panama Forest Products Company

plywood plant which was utilizing various tropical hardwoods, including mahogany.

From Panama the trip was continued to Puerto Rico to study the progress of the many mahogany plantations established by the U. S. Forest Service and private land holders. Dr. Frank Wadsworth, Director of the U. S. Tropical Forest Experiment Station at Río Piedras, was extremely helpful in taking me on a personally conducted tour of the island mahogany plantations and providing valuable and interesting information on the establishment and progress of the plantations. The whole staff at the Experiment Station helped in assembling the written information on mahogany available in the Station files and library. I consider the week spent in Puerto Rico one of the most valuable and interesting periods of the whole mahogany study.

Late in August we returned to the United States and the University of Michigan, where additional library work was completed and the job of bringing my material together in written form was begun.

A year later I was assigned by the U. S. Plywood Corporation to the Panama Forest Products Company plywood plant in Panama as Logging Superintendent. One of my major tasks on this project was to develop a supply of mahogany logs for the plant. This brought me to grips with the problems of locating and tying up a long range supply of logs, finding reliable logging contractors and determining their financial needs, and maintaining a check on the progress of their logging operations in order to assure production and maintain log quality standards.

Our greatest problem in this log procurement program was that of maintaining log quality. Two of our logging contractors had small sawmills in which they sawed up reject logs into lumber for local sale. In some ways, even though this led to utilization of reject logs, this was a disadvantage to us because the loggers were careless with the logs, knowing that they could always be sawn up even if rejected. We found that a great deal of time and money was spent in bringing out logs that would not pay the extraction costs. Efforts to correct this difficulty by working with the men in the woods was only partially effective because they all thought they knew more about the business than we did. Three associates were of great help in carrying out this program. José Díaz and Gil Villalaz, because of their knowledge of local conditions and the handling of the local people, were invaluable assistants. Peter Arnold, a Yale forester, assumed an ample share of the responsibility for the technical phases of the program.

Locating adequate stands of timber for our production program usually involved travel in primitive areas. Shortly after going to

Panama we had reports of the good timber stands in the upper Bayano River Valley. This territory was controlled by the Cuna tribe of Indians and in the past they had strongly discouraged visitors to their territory. However, preliminary contacts indicated that an exploratory trip could be made to this territory without difficulty as long as we conformed to the wishes of the tribe.

A trip was planned for early December and we left Panama City by motor launch, traveling down the coast to the mouth of the Río Bayano and up the river to El Llano. From there we continued by piragua and arrived at the first Indian village, only to find it practically deserted. No one in authority was present to give or refuse permission to continue up the river. The elders had been called to the annual conclave at Agua Clara, our destination.

We decided to go on and arrived at Agua Clara just at dusk. This village is built on both sides of a small stream. A big pow wow was underway. Our reception was rather cool and we were told that we could not attend the conclave then in progress. However, we were furnished a house on the opposite side of the river where we could spend the night.

By the time we had our hammocks swung and food cooked, deliberations across the river were well underway. We could hear long speeches and uproarious shouting and applause. This went on for hours.

Sometime during the wee hours of the night I woke to hear group and solo singing in the house next to ours. The solo voice had a very unusual and extraordinary quality.

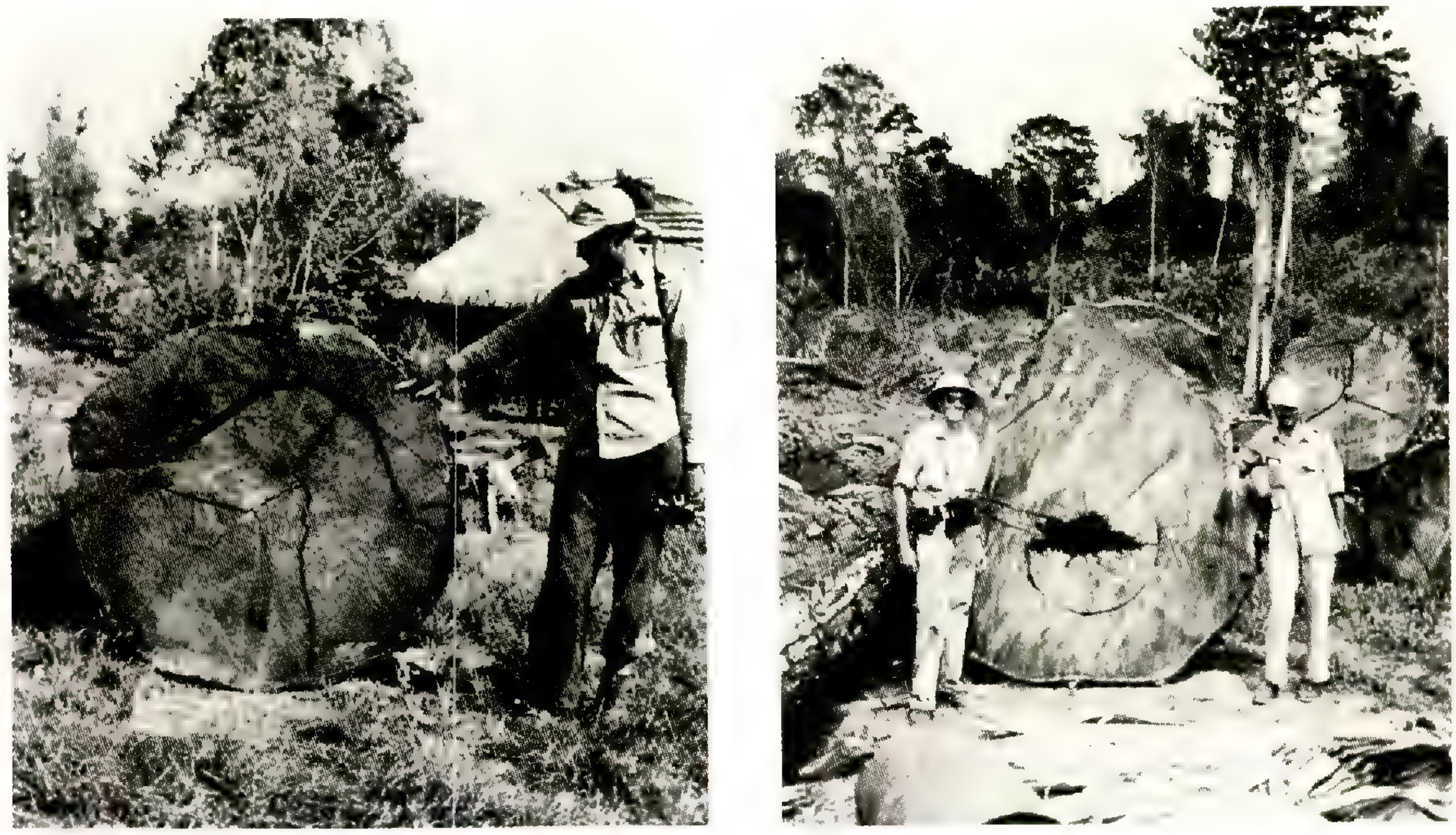
The next morning a group of village chiefs came to talk to us through an interpreter. After the usual formalities the Cacique (Chief) expressed the hope that the deliberations of the night before had not disturbed us. I assured him that quite to the contrary I had found the singing, especially, very pleasing. After this our conference went very well. We were given a guide and were even invited to visit the farthest villages on the Canaza River, which was forbidden territory to outsiders. The entire Indian country was open to us.

The guide who took us to see the timber stands in the vicinity explained later that one of the principal singers of the night before had been the Cacique who had been much impressed with my favorable comments. However, we had come prepared for a limited stay and after looking over the most accessible timber stands we returned to another civilization.

Shortly after our trip a mission of doctors entered the territory to investigate rumors of an epidemic. They were turned back and word came out that all visitors were unwelcome. Our own logging activities took us elsewhere and I had no further opportunity to develop my contact with the Cunas.

A great deal of the woods work in the mahogany camps was done by migrant labor from neighboring Colombia. We found most of this labor below par in comparison with men in logging camps in the other mahogany-producing countries. They wasted time in felling trees that

Family of Choco Indians delivering a raft of logs to log boat on the Río Balsas, Darién, Panama.



Mahogany log (left) showing splits caused by wedges during log bucking operation. The author's finger points to the wedge mark. At right is a defective mahogany log showing heart rot and ring shake. Because of stain caused by water spreading from the rotten areas into sound wood during the rafting to a ship loading point, this log is not worth transporting to the mill. The author (at right) is shown with Peter Arnold.

should have been left standing for various reasons, and unnecessarily damaged many valuable logs in felling and bucking.

In addition to organizing the logging program I had the opportunity of following the logs through the plant, observing the production of lumber and veneer flitches in the sawmill, production of veneer at the slicer and dryer, the classification of veneer in the sample room, and the manufacture and classification of plywood in the plywood section.

After two years of operation the plywood mill in Panama was closed for economic reasons and we were transferred back to the United States. This seemed to bring to a close the major portion of my study of mahogany and I took advantage of the opportunity to put the finishing touches on my dissertation and present it to my committee. Nevertheless, many interesting problems in connection with managing tropical forests and growing mahogany commercially remain to be studied. Some of these I hope to undertake if and when my work takes me back to the tropics.

A WYOMING NEWSLETTER AND REPORT OF THE CURATOR OF THE ROCKY MOUNTAIN HERBARIUM FOR THE TWELVE YEARS ENDING APRIL 30, 1953

C. L. Porter

Professor C. L. Porter has sent a copy of his report to the President of the University of Wyoming on the progress of the Rocky Mountain Herbarium through the year ending April 30, 1953. Believing that it will interest our readers, it has been condensed for publication here, and is preceded by the good letter which accompanied it — Eds.

Laramie, Wyoming
May 13, 1953

Dear Professor Bartlett:

It has been a long time since my wife, Marjorie (Fleecy) Woollett Porter, and I were at Douglas Lake and assisting in the Botany Department at Ann Arbor . . . We came west to Wyoming in our Model T Ford in 1929, and have been here almost continuously since then except for a period of graduate study at the University of Washington in 1936-1937. The years have been good to us: we like it here in the uncongested West; our work is fascinating; we have a daughter about to graduate from high school into a nursing program, one son in the final stages of university commerce work, and another son who will receive his BS degree with honor in Wildlife Management but who has an appointment as an officer in the infantry next December. We often recall with a feeling of nostalgia our Michigan days and hope to visit Ann Arbor again before it becomes totally unrecognizable.

The enclosed report will give you an idea of what goes on at the Rocky Mountain Herbarium, and some of the things we are trying to do, so I shall not go into that subject.

One matter in which you might be interested, however, concerns a most interesting and profitable visit we had recently with Dr. K. H. Rechinger, the director of the Vienna Herbarium, who stayed with us long enough to go over all our Rumex collection and tell us some of his wartime and post-war experiences. His story was pathetic, and without any optimism for the future, although he is carrying on as

best he can. A truly delightful person, too, despite terrific hardships.

The specimens in the Natural History Museum of Vienna were removed for safe keeping to a place in the country when the bombings started. Dr. Rechinger's life was spared when a bomb penetrated to the first floor of the museum building but failed to explode. (A curious coincidence was the fact that my present graduate assistant, Mr. T. H. Bell, was probably the bombardier who released that bomb and who lost an eye over Vienna.) The specimens were unharmed by bombings, but about one-fifth of the collection, including types, was lost when a careless Russian soldier tossed a match into the building where the specimens had been secreted. That loss included almost all the families of seed plants in sequence from Cycadaceae to Lauraceae, with the exception of the grasses. They are very anxious to replace as much of this material as possible and would greatly appreciate receiving gifts or exchanges to that end from any place on earth.

With best wishes for the continued success of the Asa Gray Bulletin which I am glad to see revived,

Sincerely,

C. L. Porter, Curator
Rocky Mountain Herbarium

PERSONNEL OF THE ROCKY MOUNTAIN HERBARIUM, UNIVERSITY OF WYOMING

The personnel of the herbarium has included the Curator, the Aven Nelson Research Fellow, a part time clerk, and a part time student assistant.

The Curator, Dr. Porter, devotes half time to herbarium work and half time to teaching during the regular school year, and during the summer he spends two months or more mostly in the field making collections for our institution and for exchange with others.

The Aven Nelson Research Fellow during the past year has been Mr. Thomas A. Bell, a graduate student from Lander, Wyoming. This position, newly created by the Board of Trustees in 1952, replacing the former graduate assistantship in the herbarium, was established in honor of the founder of the herbarium and its first curator.

In addition to his other duties, Mr. Bell, with some assistance, has made a detailed study of the genus *Potamogeton* (Pondweeds) in Wyoming, and has done much to clarify our understanding of these plants which are difficult to identify but which are of much value as a source of food for wildfowl and shelter for fish in our ponds, lakes, and streams. His studies will materially aid research in the field of wildlife management.

The part time clerk, Miss Nancy Barnes, a student from Evanston, Wyoming, and the student assistant, Miss Gail Bithell of Laramie, have carried the brunt of the routine work necessary for the maintenance of the growing herbarium.

THE HERBARIUM

The herbarium is located on the fourth floor of the Engineering Hall, occupying part of the east half of that floor, including three rooms as well as the hallway in which there are 14 steel filing cabinets for which no other space could be found.

The collection now includes 232,710 accessioned specimens. This represents an increase of 5,524 specimens within the past year, and 40,291 in the past ten years. Some of this increase of the past year is due to the gradual incorporation into the general collection of the Hapeman Herbarium which was received as a gift over a year ago, and whose specimens must be repaired, sorted, identified, numbered, and filed in their proper places. Much more of this work remains to be done.

A TWELVE-YEAR SUMMARY OF OBJECTIVES AND ACCOMPLISHMENTS

When the present curator took over the direction of the herbarium about twelve years ago, its most apparent needs seemed to be the following:

(1) A complete revision of the approximately 190,000 specimens in the collection at that time. There was a need to bring the nomenclature up to date and a similar need for many corrections in identification soon became apparent.

(2) Type specimens, which are irreplaceable and extremely valuable, were mixed in with the ordinary specimens and could neither be

readily located nor could they be protected from careless handling by inexperienced persons using the herbarium. Segregation of types was needed.

(3) No attempt had been made to segregate Wyoming material from that from other regions, so that it was often difficult to determine just what plants were in Wyoming and what their distribution might be. With all published manuals dealing with the flora of the region out of print, the preparation of a Wyoming Flora had become increasingly urgent so that students, research agencies, foresters, grazing interests, game and fish interests, and many others might have a useful tool to enable them to identify the plants of the region.

(4) There was no effective way for locating published data on the flora of the region, spread through a greatly scattered and diversified literature. Such a person as Dr. Nelson, blessed with a prodigious memory, might be able to lay his hands on just the reference desired, but those of us who had not grown up with the subject needed other assistance, for in research work of any kind one must be familiar with the published literature.

These four needs are gradually being satisfied as shown below.

(1) Some 13,892 new, mechanically lettered file folders have now replaced old, worn-out ones (1,822 in the past year), and the names of the specimens have been corrected.

(2) Some 3,164 type specimens (121 types in the past year) have been segregated from the general files into two special cabinets which are reserved for special use.

(3) As new file folders are inserted in corrected groups, Wyoming specimens are given red folders, to contrast with the manila folders used to designate specimens from other areas. This color-key system was suggested by the similar system used at the Chicago Natural History Museum.

An estimated fourth of the collection remains to be renovated in these ways; but it was gratifying to learn from a recent visitor, Dr. K. H. Rechinger, director of the Natural History Museum of Vienna, Austria, who is just completing a tour of all leading herbaria in this country and abroad, that the Rocky Mountain Herbarium was the most up-to-date and least confused herbarium he had encountered.

(4) The problem of keeping abreast of published literature has been largely solved by the development of a card file of about 7,200 entries keyed primarily to subject matter, and the establishment of an

extensive file of separates of research papers contained in 120 standard library-type boxes. These aids are in addition to the extensive library facilities of the department.

Needed literature, not otherwise available, has been secured on microfilm through the kind cooperation of the Harvard University library, and a microfilm reader, secured some years ago, has made such material immediately usable.

SERVICE RENDERED

Services rendered had to do with matters of identification of plants, and with loaning specimens to various experts who are engaged in research on the flora of a particular region or on monographic studies of a particular group of plants. The herbarium is also an aid in teaching.

It has been the policy of the Rocky Mountain Herbarium to attempt to identify whatever plants are submitted by persons within the State, as well as certain specialties from other sources. If not already unnecessarily duplicated, and if in suitable condition, such specimens enrich the herbarium.

In the past year approximately 200 identifications have been made for twenty individuals and agencies. Some of these were relatively simple, but others were definitely difficult, some requiring several days. The type of plant material submitted has varied, including ordinary house plants, various types of forage plants, poisonous plants, and even stomach contents of big game animals.

During the past year 3,917 specimens have been loaned to the following institutions; Harvard University, Indiana University, University of Washington, Washington State College, University of Wisconsin, University of Minnesota, Cornell University, The New York Botanical Garden, The Missouri Botanical Garden, Colorado A. & M. College, University of California, the Canadian Department of Agriculture, and the Canadian National Museum. Largest users of this service have been Harvard University (634 specimens), Indiana University (370 specimens), Washington State College (713 specimens), University of Washington (1016 specimens), University of Minnesota (106 specimens), and Cornell University (631 specimens).

Field collectors are often requested by various individuals and agencies to make special collections of seeds, herbarium specimens and living plants. A number of such services have been rendered

during the past year. An urgent request from the Eli Lily Company, for a large quantity of a certain rare kind of lily plant (*Zigadenus paniculatus*) from which a certain drug (probably cortisone) might be obtained, resulted in an expedition to southwestern Wyoming, near the summit of Cedar Mountain, where the plant was known to be abundant. Approximately 100 lbs. of this plant was secured by arduous pickaxe work in the cobblestone hillsides to secure the bulbs as well as the upper parts of the plants. Of course various other plant collections were made in that area for our own purposes.

VISITORS

Being somewhat isolated from the major centers, it is always a pleasure to receive visitors from other institutions and to thus renew acquaintanceships and learn of the activities of persons engaged in similar work. During the past year we have entertained the following visitors:

Dr. Yoshiharu Matsumura, University of Tokyo, a specialist in aquatics.
Dr. Arthur Cronquist, New York Botanical Garden, a specialist in the Sunflower Family.
Mr. C. F. Baker, California Academy of Sciences, a well known collector.
Dr. J. F. Brenckle, Mellette, South Dakota, a specialist in Polygonum.
Dr. D. V. Baxter and students, School of Forestry, University of Michigan, enroute to Alaska.
Dr. T. Arnborg, University of Uppsala, Sweden, a forester.
Dr. Louis Williams, School of Agriculture, Tegucigalpa, Honduras, a specialist in orchids and Central American plants.
Dr. K. H. Rechinger, director of the Natural History Museum, Vienna, Austria, the expert on docks (Rumex).

More facilities and space for visiting specialists who spend some time with us are badly needed and are being planned for the future when new quarters for the herbarium become available.

FIELD WORK

The purpose of field work during the summer months is fourfold: to secure new or different specimens for the Rocky Mountain Herbarium; to secure duplicates of such specimens for exchanges with other institutions; to fill in gaps in our knowledge concerning the distribution of species of plants in Wyoming so that such records,

substantiated by specimen vouchers, may be incorporated into publications on the flora of Wyoming; and to cooperate with state and federal agencies on problems concerning weeds, poisonous plants, and forage plants.

One of the deficiencies of the Rocky Mountain Herbarium has been in aquatic plants of the region, probably because it is often necessary to have special equipment to collect them and because these plants often present technical difficulties of identification. Yet aquatic plants play an important role in fish and wildfowl management, and persons working in that field wanted to know more about them. So a special effort was made during the summer of 1952 to collect aquatics extensively in our ponds, lakes, streams, and rivers. The specimens collected have been the object of intensive study by both the curator and Mr. Bell. Much has been learned, but it is also apparent now that much more can be accomplished by further work. Since the study of aquatic vegetation is often neglected even by large institutions, this might well be a profitable field for specialization at Wyoming.

Another highlight of the past collecting season was an expedition by pack train into the high Wind River Range in Sublette County. Pack and saddle horses and other equipment for this trip were generously furnished by Mr. C. C. Skinner of Pinedale. A large collection of plants from that area was secured, together with various aches, pains, and bruises!

Transportation into the field is furnished by University pool car, a Chevrolet suburban carryall with four-speed transmission, entirely satisfactory for our work. Living accommodations in the field are a tent and sleeping bag, and we do our own cooking except when close to a town. During the past three years much assistance and good company has been freely furnished by Mr. B. F. Miller of Laramie who has accompanied most of the expeditions.

EXCHANGES

Most herbaria are able to augment their resources through exchanges of specimens. Duplicates are traded on a specimen-for-specimen basis, unmounted, but with complete data given on labels furnished with the specimens. The Rocky Mountain Herbarium has exchange relations with 20 major institutional herbaria in the United States, Canada, and Europe; and much worthwhile material has been received in this way. Balance sheets are maintained for each exchange account, and an attempt is made to maintain a fair balance with all institutions. The records show that we owe three institutions, while

seventeen institutions owe us.

Two notable sets of specimens have been received recently in exchange: a large set of plants of the Canadian Arctic, including plants from as far north as Baffin Island, sent us by the Canadian Department of Agriculture, and a similar set of European Arctic plants from Lapland sent us by the University of Uppsala, Sweden. In addition we have received many fine collections from the northwestern United States and from the Southwest.

SUMMARY OF ACCESSIONS

This includes those specimens which have been received from all sources and which have been mounted, labeled, numbered, and filed in the regular collection. It does not include specimens which are on hand but which have not yet been thus processed.

Collections by staff members	454
From exchanges with other institutions	2793
From identifications furnished others	104
Gifts received	2173
Total	5524

These specimens represent virtually all parts of the world, but the majority are from northern, arctic, or alpine regions, since this institution does not specialize in tropical floras.

RESEARCH IN PROGRESS

The major research project being undertaken at the present time is a long-term one: the preparation of a modern Flora of Wyoming. Initiated a number of years ago, this project has now resulted in the preparation of treatments of 19 plant families, each such treatment being issued to all major institutions in the form of Rocky Mountain Herbarium Leaflets, a numbered series put out in mimeographed form. When completed, these will be assembled in book form and formally published, if possible. Since no published manual of the flora of the region is currently available (the well-known Coulter-Nelson Manual is out of print), this project has become increasingly urgent.

A second project, already mentioned, is the study of aquatic vegetation, initiated last summer. This will be continued for at least another year.

A NEW METHOD OF HANDLING AND PRESERVING SOFT-MATRIX FOSSILS

Herman F. Becker

Every fossil hunter will at times be confronted with the problem of collecting specimens from a soft, breakable matrix. The following suggestions may help to avoid unnecessary loss or irreparable damage to rare fossils.

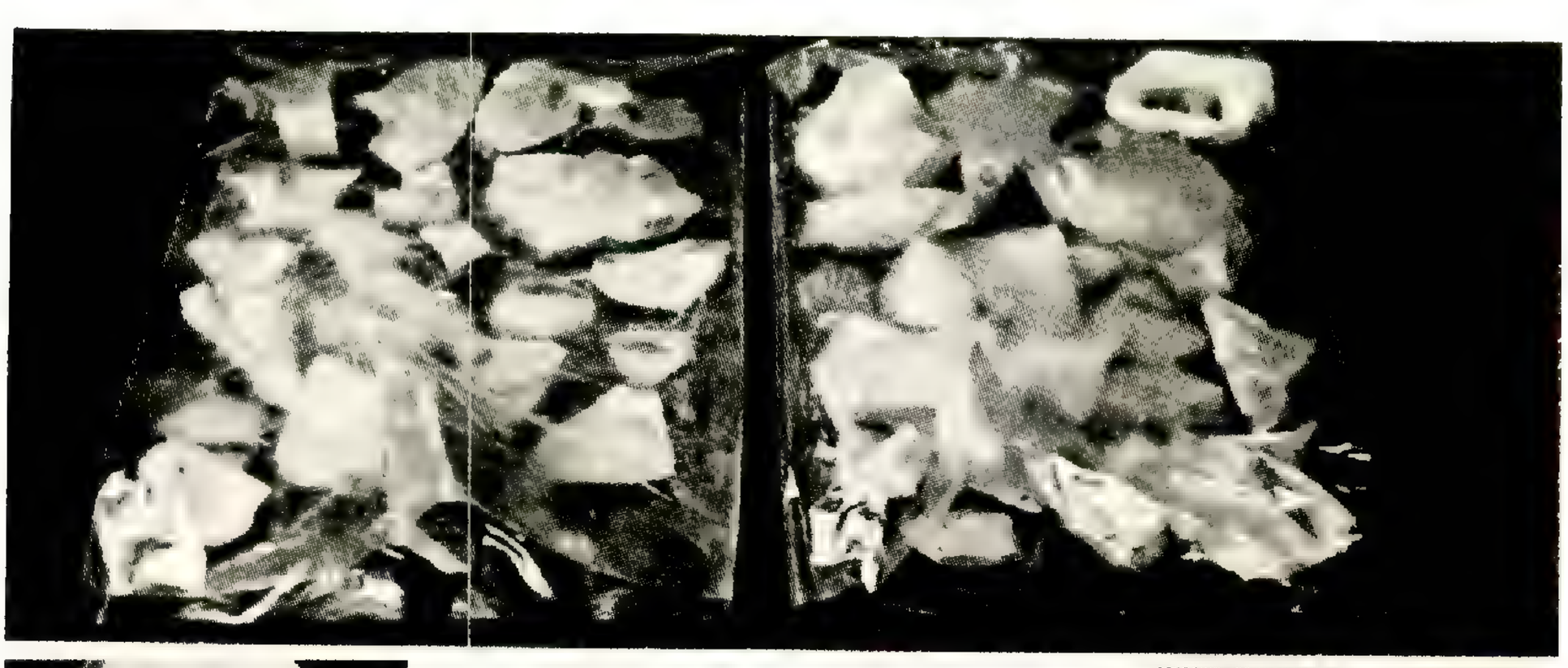
Various kinds of shales contain a certain amount of moisture while covered with a protective overload. Upon exposure to air these rocks will dry very rapidly and split or fracture conchoidally, often damaging fossil impressions contained in them.

Experience with bentonitic Tertiary soft shales of the Ruby River Basin of southwestern Montana, which contain leaves, seeds and insects, has shown that wrapping fossils in moist newspaper or toweling is not sufficient to slow down the drying process. Unless the fossils are kept in air-tight containers, paper will not only dry out rapidly but will also adhere to and damage the fossil imprints. Transportation of such fractured material increases the damage and calls for extensive repair work on the specimens.

Immediate preservation of such material in the field involves simply a thin, transparent plastic bag. Tinted or colored plastic bags are less desirable because they prevent a clear view of the specimen for later observation. For most convenient handling an 8 x 12 or 10 x 15 inch bag should be used. It must be placed on cardboard or thick newspaper and laid flat on the ground. Trimming specimens to size is best done in the field while the matrix is moist. Some rocks, especially bentonitic shales or clays, may then be cut and shaped with a knife as easily as chocolate. In fact, the term "chocolate rock" would do justice to the color, consistency and texture of this shale. The freshly dug and trimmed fossils are then immediately placed in the bag in a single layer. To prevent excessive heat and condensation within, the bag must be covered at all times with paper, cardboard or cloth. When the bag is filled to within two or three inches of the opening, the cardboard slipped under it will serve to lift it evenly into a box or other container. To prevent any loss of moisture the open end of the bag is folded under. Bags may be stacked in four to five layers, separated by cushions of folded newspapers. Fossils so treated in the field remained in this condition several weeks and were transported

by car for over 3000 miles via rough mountain roads. Every fossil arrived in excellent condition, although previous experience in the same area had shown the difficulty of successful drying of this matrix.

For the curing and drying-out process the bags are placed singly on tables or shelves after arrival at their final destination. Direct sunshine must be avoided because it tends to cause excessive condensation and dripping. With the aid of one fossil turned on edge or any other device, the mouth of the bag is now kept open. A moderate and constant amount of air will help to cure the fossils evenly and therefore more successfully. Humidity must be held at a minimum. At least ten days to two weeks of ventilation is required before the fossils may be placed in their final depository. While curing it is well to remove the drier specimens occasionally and place them together in another bag. By the same token the remaining moist ones should be kept together for uniform results. Once completely dry these shales will not deteriorate, split or fracture if unusual temperature and humidity changes are avoided. They may then be handled freely. It is not advisable to cut or chip excess matrix when dry. If the size of the specimen permits, however, later diamond-saw cutting may be employed.



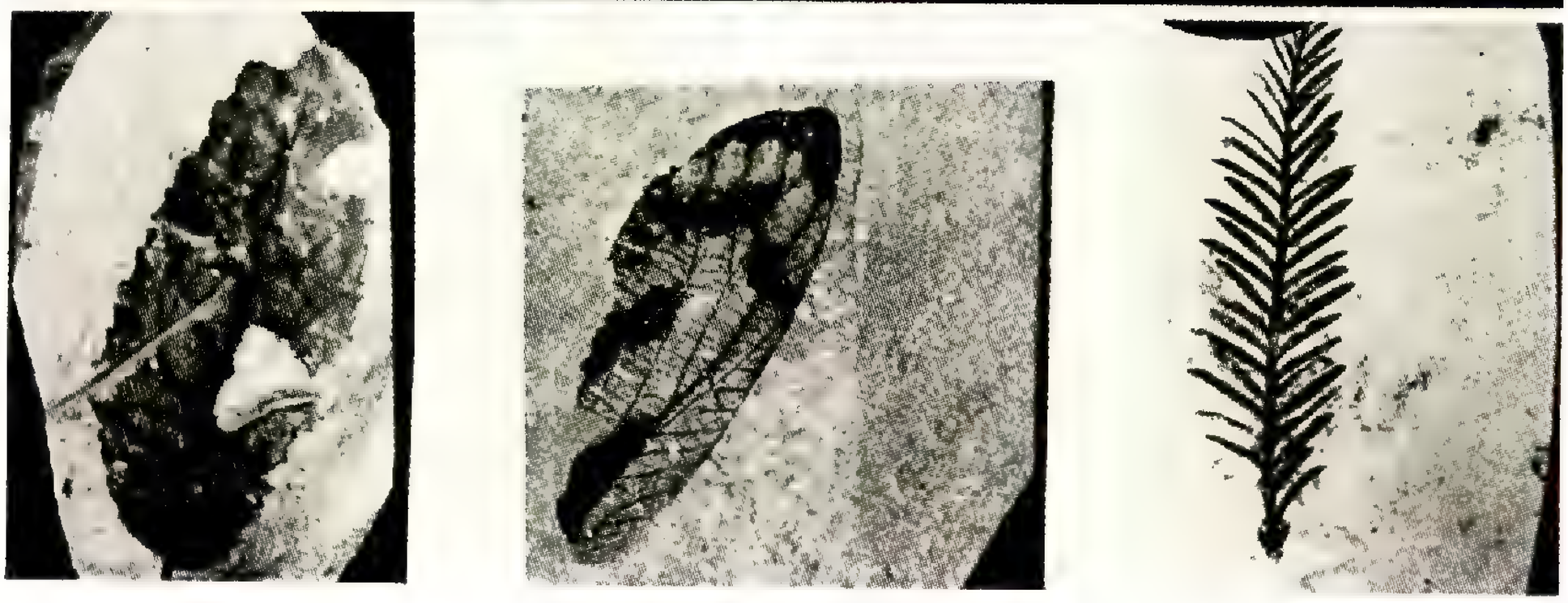


Fig.1 (above). Plastic bags containing fossils for drying. Photograph by the author.

Fig.2 (below). Insect wing (center) trimmed with diamond saw; other specimens trimmed in the field before "curing". Photograph by Stewart Lowther.

THE FLORA OF MEXICO AS DESCRIBED IN THE 16TH CENTURY RELACIONES

Ida K. Langman

Probably we all know individuals who spend much of their waking time complaining about governmental red tape and bureaucracy, about the lengthy forms they have to fill out, about the answers they must supply to endless questionnaires, etc. To hear them talk one would imagine this was all a development of the last twenty years or so. But questionnaires and red tape have been with us for a long time, as witness a questionnaire that the King of Spain sent out at the close of the 16th century to the local officials in his New World possessions. The answers to the questionnaire were to provide for the King a picture of the regions he owned and, as you will see from the questions, he wanted as complete a picture as possible. The questionnaire went to all the cities, towns and villages in the King's realm, to be filled out by what would correspond to the mayor, or the city council, or, in some cases, both. The reports, or *relaciones* as they were called, may be exceedingly important to botanists, for they provide in some cases the earliest references to the flora of many areas of North and South America. This is particularly true for Mexico, since the Mexican officials seem to have been unusually conscientious about getting the answers to the questions and sending them off to Spain.

The first questionnaire was sent out in 1577 and the heading reads in translation as follows: INSTRUCTION AND MEMORANDUM OF THE REPORTS WHICH ARE TO BE MADE FOR THE DESCRIPTION OF THE INDIES, WHICH HIS MAJESTY ORDERS TO BE PREPARED FOR THEIR GOOD GOVERNMENT AND ENNOBLEMENT. There are 50 questions: Name of the village and its discoverer, its climate, surface of the surrounding areas, the altitude, cities or towns nearby, their distance from the locality in question, the nearby rivers, lakes, mountains, and volcanoes. For coastal areas, there are questions relating to the shoreline, tides, ports, and islands. Then there are questions on the plant life, and, of course, on animal life as well, and on the rocks and minerals found in the area. Much information about the Indians is requested: their mode of life, governmental procedures, customs and traditions, the illnesses to which they are subject and the cures they use. For the more advanced communities there are questions on important constructions: churches, monasteries, and hospitals.

Some of the *relaciones* have been published, but many remain in the original manuscript form. Many of the manuscripts have fallen into the hands of private owners, of whom a few, like Francisco del Paso y Troncoso, have spent considerable sums to have the manuscripts edited and published. So far, the states of Oaxaca and Yucatán have the best record of *relaciones* published. Oaxaca alone boasts of records for about 50 localities. Other states represented are Veracruz, Tabasco, Guerrero, Michoacán, Jalisco, México, Tlaxcala and Morelos.

The questions which concern the botanist are numbered 22 to 26. In substance, they read as follows: No. 22 Trees and Fruits: The native trees which commonly occur in the said territory and the fruits and the use which is made of them, and their woods, and for what they are, or could be, used.

No. 23 The cultivated trees and fruit trees which are in the said land, and those which have been brought from Spain and other parts, and if they do well (in the region) or not.

No. 24 The grains and seeds and other vegetables and greens which are used, or have been used, as sustenance by the natives.

No. 25 Those which have been brought from Spain; and if in the land they have wheat, barley, wine and oil; in what quantity it is produced; and if silk or cochineal is there, and in what quantity.

No. 26 The herbs and aromatic plants with which the Indians cure themselves, and their medicinal virtues or their poisonous qualities.

As typical of the answers which were prepared, I have selected the following report sent in by Antonio de Leyva for the town of Ameca, in what is now the state of Jalisco.[1] The translation, with some comments by me, follows:

To the 22d chapter the answer is that in the territory and mountain ranges surrounding the village there are many trees: oaks [for which he gives the two common names, *roble* and *encina*]; tepehuaje

[1]Discripcion hecha por el Ilustre señor Antonio de Leyva, alcalde mayor por S. M. del pueblo de Ameca, año de 1579. Instruction, y memoria, de las relaciones que se han de hazer para la descripcion de las Indias, que su Magestad manda hazer, para el buen gouierno y ennoblescimiento dellas. Noticias Varias de Nueva Galicia, edición de "El Estado de Jalisco", pp. 233-282. Guadalajara, 1878.

[*Lysiloma* to the botanist]; and mezquite: This wood is very tough and is good for water mills and mills for crushing ores, and for other things which require a hard material. There are some ash trees and pines in the higher altitudes of the mountain regions, very difficult to get out because of the harsh terrain. There are many other kinds of wood but they are not used by the natives of this village nor can they be taken out to other parts.

To the 23d chapter, the answer is that the fruit trees that are in this said village and its territory, and which were used, and are used, are the mezquites, a kind of carob bean tree, very sweet and healthful; zapotes, a round white fruit [probably *Casimiroa*]; *ciruelas* [not plums, but species of *Spondias*, still so-called], yellow and purple, sweet and unwholesome;[1] *aguacates*, black and green, with a large stone inside and with a taste like nuts; guavas, a round fruit with sweet seeds; huamustli [probably *Pithecellobium dulce*, widely known as *guamuchil*].

Those which have now come from Spain are oranges, limes, lemons, pomegranates, figs, quinces and citron. All these fruits do well in this village, although there are very few of them because the people here are lazy and have no interest in raising trees. Peaches do not do well although they have been planted, nor are there apples, olives, pippins, nor pears, nor grapes, nor have they been tried, so it is not known if they would grow or not. And this is what is known for this chapter.

To the 24th chapter it is answered that seeds of wheat, barley and corn do well and other things that they plant, like chick peas, beans, coriander or anise, and all kinds of vegetables.

To the 25th chapter, it is answered that in this said village, nor in its territory is there cochineal, nor is it produced in small or large quantities, nor do the natives here know of its culture. And this is what is answered to this chapter.

To the 26th chapter, the answer is given above, in the 17th chapter, as far as medicinal herbs are concerned [I will return to this below]. In this village there are neither poisonous herbs nor roots, nor do the natives know of any. The aromatic plants that they use are: cacalojochitl [*Plumeria*]: they are like carnations with a good fragrance, and they are not used for anything else. Umijochitl is a white flower with a good fragrance like that of lilies [I cannot identify

[1]In the Spanish text the word is *enfermas*.

this plant]. There is another one, a red one of pretty appearance but little odor, which they call tzacjochitl [this is perhaps an orchid]: The roots of this serve as paste or glue for the dyes and colors of the images they make. They have none of the flowers of Castile like carnations, lilies, irises, nor chamomile, nor have they been sown or planted, nor is anything given for them.

Chapter 17, referred to above, discusses diseases and the medicines used for curing the illnesses. The appropriate part of the text follows:

> The illnesses which are most common among the natives are: coughs and colds and for this illness they use an herb which they call tlacopahtli, ground and drunk and placed on the forehead [this is probably a species of *Aristolochia*]. They have the tertian fevers and for this illness they use an herb which they call yauhtli [perhaps the author means huauhtli, *Amaranthus*] and one which they call cempoaljochitl [*Tagetes*]. These herbs are ground and dissolved in water and with them they lave the body, since it is something cold and good for fevers. They have pains in the side and fevers, and for a remedy they have the pulpy leaves of the maguey [*Agave*], which is found in great quantities in this territory and with the juice of these leaves, and with the roots of another herb which they call tetlatiani [*Bursera*], they annoint themselves and drink of it. They have the itch, mumps and pustules; they use for these ills a resin of some trees called copalquahuitl [probably also *Bursera*] and an herb which they call, or its root, which they call camitl [I think this should be camotl, *Ipomoea*]. This is an herb which they give to the ones who are ill. They give the roots well cooked and with water in which it was cooked they purge them. It is so strong and so effective that it purges them through the ordinary ways by mouth and other openings, and they remain cured. There is in this territory a root that is extremely good as a purge, so that from all around they come for it. They call it the root or purge of Jayamitla [perhaps he refers here to *Ipomoea purga*, jalap]. In addition there are other purgative herbs, but the natives do not use either purges or bleeding.

Careful study of this and the other *relaciones* could result in an interesting and valuable picture of the most common and useful plants of Mexico as they were reported some fifty years after the Conquest. They often include records of the introductions of cultivated plants, and for this reason alone they well deserve further attention from botanists.

Following is a list of the published works, which have come to my attention, which include *Relaciones Geograficas*: Anales del Museo Michoacano, 1946; Archivos de la Historia de Tamaulipas, by Gabriel Saldivar, 1946; Boletín de la Sociedad Mexicana de Geografía y

Estadística, 2a Epoca, Vol. 2, 1870; Boletín del Archivo General de la Nación, 1945, 1948; Boletín del Museo Nacional de Mexico, 1924; Colección de Documentos Inéditos Relativos a la Historia de América y Oceania, 1865; Colección de Documentos Inéditos Relativos al Descubrimiento, Conquista y Colonización de los Posesiones Españoles en América y Oceania, 1864-1868; Colección de Documentos Inéditos Relativos al Descubrimiento, Conquista y Organización de las Antiguas Posesiones Españoles del Ultramar, 1898; Colección de Documentos para la Historia de San Luis Potosí, by Hernando de Vargas, 1897; Crónicas y Relaciones del Occidente de México, by Fernando Ocaranza, 1937-1939; Archivo Histórico Geográfico de Tabasco by Manuel Mestre Ghigliazza, 1907; Memorias de la Sociedad Científica "Antonio Alzate", 1889; Papeles de Nueva España, by Francisco del Paso y Troncoso, 2d Series, 1905; Relaciones de Texcoco y de la Nueva España by Juan Bautista Pomar, 1941; Relaciones Geográficas de las Indias, by Marcos Jiménez de la Espada, 1881-1897; Relaciones Geográficas de Nueva España, edited by German La Torre (Biblioteca Colonial Americana, 1920), published first in Boletín del Centro de Estudios Americanos de Sevilla 7 (32-33): 1-32. 1920; Relaciones Geográficas del Siglo XVIII, collected by Francisco del Paso y Troncoso, edited by Vargas Rea (one group covers Jalisco, another Oaxaca, etc. These are still being published); Revista Mexicana de Estudios Históricos, 1928; Tlalocan, edited by Robert Barlow, 1943-48; Voyages, Relations et Mémoires, published by Ternaux-Compans, 1840.

CAMP ARBUCKLE, A CENTURY LATER. — George J. Goodman.

In the spring of 1849, Captain Randolph B. Marcy was ordered to head an escort from Fort Smith to Santa Fe "for the purpose of affording protection to our citizens migrating to our newly acquired territories." The following year Marcy established a fort along the route. The site he chose is about two and one half miles northwest of Byers in McClain County and was known as Camp Arbuckle or Fort Arbuckle. The next year, 1851, army officers moved the garrison to the site near Davis, where it became known as Fort Arbuckle. The old Camp Arbuckle was occupied by a group of Indians headed by Black Beaver, and hence the station became known as Beaverville, or Beavertown, or Beaversville, or Beaverstown. In but two more years, Lieutenant A. W. Whipple was leading an expedition from Fort Smith to the Pacific with Doctor J. M. Bigelow as physician and botanist. The appearance of the prairie through this central part of what is now Oklahoma often brought admiring praise from the early explorers, and descriptions of the region are frequent in log and diary. Doctor Bigelow wrote[1]

[1]Bigelow, J. M., 1857, in Pac. R. R. Rept. 4: p. 2

"Near old Fort Arbuckle, and in the vicinity of the 'Cross Timbers', the scenery is most beautiful and picturesque. Belts of timber crossing the more elevated plateaux in various directions many times, at right angles with each other, give them the appearance of vast cultivated fields, formed on a scale of great magnificence, stretching away in every direction as far as the eye can reach. The same beautiful views were noticed in the vicinity of Delaware Mount, near the centre of the Indian Territory." Five days were spent at the old camp, and Bigelow devoted part of the time to collecting. *Lespedeza capitata, Ammania latifolia, Oenothera speciosa, Ludwigia natans* and *Gaura biennis* var. *Pitcheri* were specifically stated as having been collected at or near Beavertown. Many other characteristic prairie plants were listed as having been collected in the area between the present towns of Holdenville and Hinton. Whipple records that wood and grass were plenty, but the season was dry and only standing pools of water occurred in the creek near the camp. The days that Whipple and Bigelow were at the old garrison were from August 17 to August 21, 1853. On August 22, 1953, the writer wandered over the hills and down the ravines at the site of old Camp Arbuckle. Again, the season was dry. This time no water was in the stream. Except for the wooded ravines nearly every foot of ground is or has been plowed. Perhaps, more or less by chance, the area around old Camp Arbuckle is about as changed from the original prairie as pasture and plowed field can be. At the outer edge of a barnyard, *Parthenium Hysterophorus*, an introduction from tropical America, was common. In the adjacent sandy fields, *Solanum carolinense* forma *albiflorum* was infrequent, and *Solanum Torreyi* was common. In a nearby ravine, *Acalypha virginica* was occasional and an aggressive *Lippia* grew at the edge of the upland forest. Far more common than Bigelow could have seen it was sand bur (*Cenchrus pauciflorus*), where it infested the pastures at the site of the old fort, along with the introduced Bermuda grass and Johnson grass. Agressive natives, such as *Eragrostis oxylepis, Andropogon saccharoides, Froelichia gracilis, Monarda punctata, Solanum elaeagnifolium, Gutierrezia dracunculoides* (a good indicator of eroded soils in this region), and *Vernonia,* were abundant among the mass of *Croton glandulosus* and *C. monanthogynus.*

A wooded ravine, scarcely a hundred yards from the site of the old fort, includes in its woody flora black willow, green ash, black hickory (*Carya texana*), and sycamore. The sycamore, incidentally, is here at its westernmost limits in central Oklahoma. The abundance of the willow is indicative of change that the woody flora has undergone during the century. As the sun dropped into the beautiful prairie skyline that Whipple and Bigelow had viewed, a rabbit scampered into a thicket. He, and a nearby farmer's milk cows, seemed to represent the vanished bear and buffalo as the weeds and crops of today replace the far-flung prairies of yesteryear.

FRANÇOIS CRÉPIN ON BOTANIZING

Lloyd H. Shinners

Late in the 19th Century the younger Hooker was led to exclaim to some of the botanical students of the day, "You young men do not know your plants!" What would he think of the modern graduate in botany? Now one gets a Ph.D. in the science without knowing most of the plants he encounters every day. Chromosomes, statistics, fancied phylogenies, current fads in morphology and physiology — about such things, like the modern major general, he is "teeming with a lot of news," at least until oral exams are over. If he goes on to teach, it will be to relay the same things, occasionally refurbished, to hordes of freshmen. The general student, though he have no intention or desire to become a professional botanist, must nevertheless master the technicalities of the whole professional field. A simple, direct, spontaneous interest in plants will not do; that is not Science. But to preserve him from extreme specialization, he may be compelled to take "integrated" courses, "progressive education" courses (to what?), or "general education" courses. He must not take up any modest, specific pursuit that he can go ahead with on his own, and that will remain actively a part of his life; such things are old-fashioned.

No one has yet explained clearly just what was so bad about those old-fashioned ways. Amateur naturalists of the past century contributed heavily to the great research collections in our museums, and very many of them carried on worthy research themselves. Their avocations were useful and beneficial both to themselves and to others; they were not merely devices to waste time. Today in America the amateur naturalist is nearing extinction. Part of this may be laid to the social trends of the times: to the rise of spectator sports and mass entertainments of a passive kind. But at least as great a share of blame must be laid to the botanical and zoological teaching of the present day. It does not lead students into participation; it deadens them with efforts to get across quantities of information and perspective that can be really absorbed or acquired only through prolonged experience.

Formerly in Europe a number of great botanical exchange clubs existed, largely patronized by amateurs. Now, after two world wars, only one survives. By two paths we can witness the realization of T. S. Eliot's flippantly grim declaration: "This is the way the world ends, Not with a bang but a whimper." Cultural impoverishment does not reveal itself only in the direct results of bombs and weapons of war.

François Crépin's *Manuel de la Flore de Belgique* was published in 1860. Typical of the many local floras and pocket guides published for most European countries, it reveals also the enthusiasm and enjoyment that botany once occasioned. It is technically respectable and adequate, in contrast with the flimsy, trivial wild flower guides which serve the American public of today. There has been an appalling deficiency of local floras in the United States — works of a kind which amateur naturalists could well undertake. Is there any prospect of such works being produced in the future, or has progress down hill already gone too far? I dare to hope that this resurrection of Crépin's words of a century ago may lead one or two moderns to attempt something of the kind.

The following somewhat free translation is of one paragraph of the foreword, and almost the whole of the first three parts of the introduction. The remainder (covering the plant geography of Belgium, the nature of plant species, a glossary, list of Belgian botanists, and publications cited, as well as the keys and catalogue of species) has been omitted.

FOREWORD

In publishing this work, it is my intention to come to the aid of the numerous pupils in our schools and of our local botanical amateurs, hitherto reduced to employing foreign books in which only an incomplete representation of our flora is found. The real desire to be useful has perhaps led me to presume upon my abilities, and has inspired me to undertake a project which others would doubtless have elaborated with better knowledge. While rightly attributing most of the imperfections of this work to the inexperience of the author, one should still be mindful of the low state in which descriptive botany finds itself in Belgium. Our weakness in phanerogamic botany cannot be concealed: it leaps to the eye of anyone who glances over our modest scientific resources. We must all work with diligence, if we would raise ourselves to the level reached by our neighbors. They, I am confident, will look with kindly eye upon our efforts, and extend a hand for the courageous exertions we make to rejoin them.

BOTANIZING

Everybody knows that botanizing means taking a walk in the midst of the fields or woods with the aim of collecting plants, to study them first, then to dry them and preserve them afterwards in a herbarium.

At the start of his botanical studies, the beginner should limit himself to walks in the immediate neighborhood where he lives. There, in a quite limited area, along roadsides, in the shade of hedgerows, in fields, meadows and woods, he will encounter many unknown plants which will occupy all leisure time during the first year of study.

In his first botanical excursions, he should be restrained and content himself with a few plants which are not completely strange to him, and of which he knows the common names. Frequently, at the locality of his collecting, in the midst of a meadow or under the shade of a tree, he will stop, and, seated on the grass or on a bed of moss, will try to identify the flowers he has collected. His botany manual open on his knees, all absorbed in analysing the different parts of a plant, pulling apart the petals and stamens, dissecting the fruit with his pocket knife, and examining all these structures with naked eye or with the aid of a lens, he will force himself to work through the key characters, couplet by couplet, which will lead him to the name of the species. With a little attention and patience, he will succeed fairly often in his first attempts at determination. What will his joy not be, to return home with a fist full of flowers that he has finally been able

to name! Who is the botanist, now old, who does not recall with pleasure his earliest identifications, made out in the field, and does not remember how proud he was at being able to name an anemone, a buttercup, or a spring Draba among the other mustards? Who is there who has lost all memory of those first days when he began to babble scientific jargon and talk of stamens, pistil, corolla, cauline leaves and radical leaves?

Back in his room for study, the apprentice botanist should carefully review the determinations made during his ramble, and make sure that the complete and detailed descriptions in his Flora apply exactly to the species he has just named by means of the analytical keys in his botany manual.

His first steps in the science will not be without some difficulties, especially if he is alone and dependent on his own resources. That which appears simple and elementary after a few months of work is singularly obscure at first; the very words calyx, corolla, stamens, so frequently repeated in the books, inspire a sort of dread. To gain an acquaintance with the names of the first plants, every means can be used: analytical keys, common names, books with illustrations, etc., etc. The first two or three dozen species to become well known will serve as landmarks, to guide one among the multitude of plants which decorate the fields and woods, and this nucleus of knowledge so painfully acquired will soon grow like a snowball. The first hundred identifications cause more difficulty than the next five hundred. If the beginner should fall in with an experienced botanist or teacher, his first difficulties will be lessened, for when he fails to figure out the name of a species, he can turn as last resort to the knowledge of another, after having exhausted all the means at his command.

During a year at least there will be no point in going farther than the neighborhood where one lives, and since the excursion will be short, one can, if necessary, do without a box for bringing back the plants; only one should choose for his outings the hours of the day when the sun is not too hot. The vasculum is often a veritable calamity for the beginner, to whom it is distasteful to appear in the streets of a village or town with this contraption at his side. After a whole season of practise and short outings, the most timid grows bold, and one sees him, the second spring, take off resolutely with the vasculum at his back, defying the raillery of his friends and braving the gossip. I know one ardent amateur naturalist who did not care at all for using the vasculum, and who thought up an ingenious means of doing without it. On seeing the beautiful specimens in his herbarium, one would never suspect the method he found for bringing them back from the field. On his walks, one would never guess he was botanizing, unless one saw him stop suddenly before a plant and collect a specimen of it,

then gently place his huge felt hat on the ground and fill its ample interior with his gatherings.

The ordinary apparel of botanists is the cause of minor tribulations. They are often taken for salesmen, land surveyors, and I know not what! Sometimes when you are busy in a meadow or at the edge of a field digging up some plant, the owner of the field or some old shepherd will drop by, full of curiosity, to watch what you are doing and invariably to ask what good the plant is and what sort of drug or salve can be made with it. Don't be at all dismayed at being thus demoted to a mere herb-gatherer, and be sure to explain the purpose of your scientific work: you won't compromise yourself at all, and your questioner will leave with a smile, giving you to understand thereby that you haven't taken him in. If the sight of a vasculum results in our being taken for pedlars, of what concern to us is the opinion of the good gentlemen we happen to meet along the way?

After this first season spent in collecting and determining most of the common species forming more or less the bulk of the vegetation, one can undertake, about the spring of the second year, to extend one's excursions for two or three leagues around. And only after the first year of trying and experimenting does one begin to realize that in order to have a real acquaintance with plants, it is not enough just to know their names and to have dried scraps of them, but that it is necessary to study them from various aspects, at different times of their life, and to prepare complete specimens both in flower and in fruit. [1]The use of a vasculum and small trowel then become indispensable.[1] Before going any further, let us say more of these objects. For the vasculum, aluminum is preferable to zinc, on account of its light weight. Its form is that of a cylinder with square-cut ends of elliptic shape. ..... In the larger towns, one finds these vasculums ready made at certain stores. ..... The trowel is an indispensable instrument for digging up roots and bulbs. ..... The botanist will round out his equipment with a stick of dogwood, hooked at the end. The hook of this cudgel is very useful, either for pulling to shore floating or submerged water plants, or bringing down branches of trees for the flowers or fruits, or helping oneself over trunks or stumps, climbing steep hills, or clambering among rocks. Further, this staff serves to test the ground in crossing bogs or marshes, and its weight renders it a redoubtable weapon in warding off attacks of the canine race, whose anger is sometimes aroused by the botanist's attire.

[1]In the distant wilds of the U.S. of North America, especially in drier regions, it may prove better to collect directly into the plant press, and eschew the use of the vasculum altogether. Also, a small hand pick or geologist's hammer, or a heavy knife, may serve better than a trowel. (Translator's note.)

Before setting out on an all-day excursion, it is necessary to be equipped also with a Manual or analytical Flora, a good route book, and a book for field notes. Too often the field notebook is neglected, and I cannot sufficiently recommend it to the serious amateur who wishes to know exactly the composition of the flora of the areas he explores. These field books should be filled out right during the excursion, and the names of the species observed written right when they are found. If one waits till returning to take notes on observation, he risks making errors. Anyway, nothing is easier than to jot down in pencil as one goes along the names of the plants and their locations. If later on one proposes to publish the results in a Flora or systematic catalogue, he will have a valuable resource in the field notebook. It is only necessary to reorganize the many notes contained in it to have a faithful account of the territory covered. In case one does not wish to make use of them oneself, these notes will still not be without value to science, for sooner or later some botanist may have need of data on the district or province studied. In either case, if one has failed to take notes of discoveries and observations, what complications will not present themselves, whether in publishing a Flora or in responding to requests for information? Memory must serve, but she is deceitful, and details found in the herbarium are not enough.

Apart from the scientific aspect, the field notebooks become a fascinating record to peruse. In going over these long lists of names and places, memories throng to the mind; one is transported anew to the midst of the fields, finds himself again in this or that place, in the company of friends with whom he has shared the pleasures of happy labors. The dry lists are transformed into a detailed history, in which are recorded down to the most trivial items the events of past days.

The book intended for notes may be of 50 or 100 pages of white, fairly durable paper of small format. At the end of each season, it is deposited in the library, and a new one started the next spring. The pages of one part of this small volume are divided into three vertical columns: the first for the names of the species, the second for the kind of area and nature of the terrain, the third for the name of the locality. The record for each outing is preceded by the date, and separated from the next preceding by a prominent pen line. It goes without saying that very common species seen at every step need not be entered, but only those judged to be somewhat common, rather rare, or rare for the area.

So now our botanist is ready to take off with tools and equipment in search of the unknown. He leaves with the pleasant anticipation of returning at evening, his vasculum full of interesting items. In his rambles, let him disdain fatigue, and not confine himself to beaten

paths, for, like a luckless hunter, he risks coming back as empty-handed as when he started; let him visit the corners and recesses of the woods, follow up shaded streams, and hardily climb up the cliffs. What to him is weariness if, at evening, he returns home burdened with a precious harvest? For some time his local trips will be rich in novelties, but as the country becomes better known, these discoveries will become less common. On the other hand, he will more fully appreciate the value of rarities which he happens to encounter. What emotion will he not feel, after long and difficult search, to find himself face to face with a long coveted species, which he perhaps had known through seeing dried specimens or a picture? He will experience the real and deep joy of a hunter who bags a noble specimen of game, or of the bibliophile who discovers a rare and priceless edition. If at such a moment he is by himself, the joy of discovery will not be quite so full as if a companion were there to enjoy it with him. Solitary excursions are generally the lot of amateurs living in the country or small villages; in a town there may rarely be two botanists to join forces in their rambles and their work. These solitary walks have a tinge of sadness, but nonetheless they offer certain advantages over those more gay ones made with a small crowd. Alone with his thoughts, beholding the panorama of nature, and in continual communion with the objects of his studies, the observer is ceaselessly led to reflect upon the laws which govern living things, and to seek a solution to the countless problems that Nature presents everywhere. In the solitude of the woods, in the midst of an immense heath, the meditations of the naturalist are more connected, and his thoughts rise to loftier heights than between the four walls of a study room. Aside from that, the isolated searcher possesses greater freedom: he stops where he sees fit; he studies a plant at his leisure, seated against a tree or perched on a rock, and has no need to consider the impatience of a travel companion. If he has just made a valuable find, can he not still share his pleasure with his correspondents, who will rejoice in his good fortune? Whatever the drawbacks of solitude, let the botanist avoid, while botanizing, the company of those who are strangers to science, or who pursue another branch. A botanist cannot adjust himself to the pace of a geologist, still less that of an entomologist. I strongly recommend to the isolated observer that he get in touch with kindred spirits in the region. It sometimes happens that between two neighboring districts two botanists, unknown to each other, make excursions even to the same field, without suspecting the existence of a confrere in the vicinity.

Let us go back to plant collecting, and review the various means of keeping fresh the plants taken. During the hours of the day when the sun is hottest, be careful to carry the vasculum on the shady side of the body. On warm days, plants will keep better if numerous and

crowded in the vasculum. A good way of keeping them fresh is to moisten them from time to time, and to keep a layer of moss or damp grass in the bottom of the container. If ill luck should have it that there is a shower, do not stop collecting under the pretext that rain-wet specimens dry poorly and mold afterward in the herbarium. For my part, I have never encountered difficulties in preparing plants that have been rained on: in such cases one must change driers which have absorbed the external moisture of the plants sooner after putting in press. Whenever, at evening, one returns tired and hungry, and so less able to attend with proper care to the preparation of the material, it is well to leave the vasculum in a cool place or a cellar. During the night, plants slightly wilted the evening before become refreshed like the botanist, and the next morning plants and botanist function very nicely.

Before leaving for excursions of several days' duration, I want again to call the attention of beginners to several recommended practises, to help them succeed in their investigations and give an intelligent direction to their searches. A good route map (one pasted on a stiff back and folded so that it can be carried in the pocket) will be of the greatest assistance in becoming oriented in a region one did not know before, and learning the names of villages, creeks and rivers. A shortcoming of most botanists, young and old, is to follow almost the same route in going to one or another distant point in their district. They habitually stick to the same course, the same path, without wondering if to right or left there is not a field or meadow which might conceal a new species. It sometimes happens that for a whole decade one can pass by a spot which all the while contained several novelties. This eccentricity explains how botanists who are strangers to the area lead you to finds which you have overlooked. So vary your itinerary as much as possible, and take advantage in going to or from distant points of the chance to cross a field or follow a hedgerow which has not yet been inspected.

The use of a geological map is likewise most helpful. The observer living in a region of varied geological structure will notice early the marked preference of certain species either for calcareous rocks or for siliceous ones. He will be struck by the contrast presented between the rich and varied flora of limestone hills compared with the monotonous and poor one of schist outcrops. He will want to know the reason for these differences, and thus will be led to the study of plant ecology.[2] The desire will grow on him to check on a geological map the extent of the various rock formations of his district, to

[2]"Phytostatiques" was Crépin's word; ecology was not to be invented for another third of a century. (Translator's note.)

follow the continuation of these same formations into neighboring provinces and even beyond, and to see, by examining Floras of these regions, if the same species occur consistently through the entire extent of the different outcrops. This scrutiny of Floras of neighboring areas will furthermore lead him to make new discoveries. Noting the regular presence of certain species on rock types represented in his area only by isolated outcrops or narrow extensions, he will make special visits to these spots, perhaps previously neglected, and will quite often meet with success.

The goal of the botanist-explorer thus becomes multiple: it is no longer merely in order to obtain plants to study and to keep in a herbarium that he botanizes, but he will remember at all times to indicate the type of habitat preferred by these same plants. To these two items will soon be added a third; for, having seen right at the start that plants do not grow indifferently in all sorts of places, he will suspect that the preference of certain plants for this or that kind of soil, which is necessarily a consequence of the breakdown in greater or lesser degree of the rocks or of their chemical composition, is often subordinate to a more general influence, that of the distribution of heat over the surface of the globe. He will thus be led to a general study of plant geography.... Then his studies will acquire a greater significance for him, as he realizes how much the data he assembles can advance our knowledge of plant geography. In his own district, he may perhaps be able to record the northernmost occurrence of a southern species, or the southernmost occurrence of a northern one. From a very local point of view, he will be stimulated to cooperate in advancing the knowledge of the plant geography of his own country.

A practise which I recommend to the collector is to abstract from floras and catalogues the data they contain about the territory to be explored, and to arrange the information by flowering time and locality. My work has often benefited from this useful practise. In order to have the species better in mind, it is well to read the descriptions, look at the illustrations, or examine dried specimens. If no flora has been published for the region, check those of neighboring countries with similar physical conditions, and abstract them in the same manner noted above. If one botanizes without system—in other words, without having obtained a precise idea of the nature of the country, without knowing its geological and mineralogical constitution, without any notion of the composition of its flora, and without taking preliminary notes, he will overlook or mistake a great many interesting species which escape the inattentive eye, because of small size, or unusual habitat, or resemblance to common species.

In concluding these recommendations, it will be worth while to warn beginners against the fear of exhausting the field of their

researches within a few years. Such a fear should not be allowed to diminish one's efforts, for the more they seem likely to exhaust the area, and the more the flora becomes familiar, the more it will become plain that this fear is groundless. Finally, after several years, one will have collected 800 or 1,000 species, with a certain number of varieties, but there will still remain for study and collection those thousands of forms which constitute the varieties and minor variants of the 800 or 1,000 already obtained. And there is no guarantee that among these thousands there may not be still a certain number which are distinct but hitherto unknown, and on closer study one may have the pleasure of elevating them to the rank of species. These numerous forms are an inexhaustible mine for the industrious worker. It is true that botanizing becomes less interesting, and does not so often offer the chance to discover one of those species vulgarly called Linnean, but it can be varied from time to time by trips to neighboring districts where fellow botanists live. During the favorable months of the year, small expeditions can be arranged by two or three amateurs to distant localities. The hope of some day making a trip to the high mountains or the sea shore, or to foreign countries, may sustain the patient worker in the somewhat monotonous task of studying home species in close detail.

This leads me to some remarks about trips made out of the usual area, and lasting perhaps eight to fifteen days.

Before undertaking such an expedition, it is essential to study maps of the soil, topography and streams of the country to be visited. It is also necessary to go through the floras of the country, and enter systematically in a notebook the data they contain about sections that have already been thoroughly explored. Once the place and date have been settled, one looks to the gear to be taken. As regards clothing, this should be kept at a minimum, so that all can easily be contained in a single overnight bag. Above all do not forget a pair of slippers, a most welcome comfort after a tiring day spent in hobnail boots. The overnight bag may likewise hold an elementary Flora, paper and other needs for writing and drawing, as well as dissecting 'scope, a lens, forceps and scalpels. It will be necessary to carry one or two presses with straps, and enough paper for the anticipated collections. It is not wise to leave with empty presses, in the expectation of obtaining paper on arrival, for one might be disappointed. Even in a county seat it is not always possible to obtain paper suitable for pressing plants, and the lack of it is even more to be feared in smaller towns, where it is sometimes necessary to stay.

I have assumed that such an excursion will be made with a small group, and it is then that it offers the greatest attraction. I appeal to other botanical travelers, to say if trips made in the company of two

or three friends have not left them the most fresh and charming recollections. Do they not recall with lively pleasure those days when they set out bright and early, vasculum on back, when they rambled across unknown woods, meadows and bogs which promised to yield so many new things; do they not remember with enjoyment the picturesque scenes admired together, the emotions produced by the abundant collections; do they not find pleasure in thinking sometimes of those noonday halts, made under the shade of an oak or on the turfy bank of a clear stream, to eat out of hand some morsel carried that morning in the vasculum? These memories are ineffaceable, and long years afterward are still the subject of conversation among botanists.

It is better to leave in the morning and return at night than to divide the day in two. While traveling, after having seen to gastronomic needs, it is necessary, instead of resting, to busy oneself forthwith in caring for the plants collected during the day. It is a job which must not be left till the next morning, for upon arising it is necessary to change driers of specimens of the previous evening and preceding days, and spread them out so that they can dry and be ready, by day's end, to receive a new batch of specimens. After these duties, and before breakfasting, one takes notes on plants left for this purpose in the vasculum the previous evening. Days thus passed in botanical travel are laborious, but on returning home, one has truly won the right to repose, and the leisurely study of the fruits of his endeavors.

COLLECTION AND PREPARATION OF SPECIMENS. HERBARIUM.

Plants intended for the herbarium should, so far as possible, be collected in dry weather. Each one should be collected with all parts. If the plant is herbaceous, of small or medium size (which is most often the case), collect it entire, with root or base; if it is tall, the upper part and some basal leaves will do. For trees and shrubs, it is sufficient to take branches with a bit of bark. Finally, if the plant is a parasite, collect it with a bit of the species to which it is attached.

Do not confine yourself to collecting species in flower only, but take fruiting specimens also; further, if the plant loses its lower leaves before flowering time, take the trouble to collect rosettes in winter. The species should be so represented in the herbarium that it can be studied completely from the earliest leaves to final maturity.

Ordinarily a certain number of plants will necessarily be ruined by dissecting for study, and it is always well to collect several: the best are kept for the herbarium. If it happens that a species of one's area is very rare elsewhere, provision should be made to satisfy the needs

of correspondents. However one should take care not to exterminate rare or interesting plants at their localities. There are already so many destructive influences that the botanist concerned about the future should avoid impoverishing the area of his studies by unrestrained collecting; he should even be careful about revealing the stations where certain rare plants grow to any but amateurs on whose discretion he can depend. To anyone conscious of the importance and interest of plant geography, such a caution is superfluous. The botanist planning to collect for exchange should select localities where the species occurs in abundance. A good way to conserve those less plentiful is to collect only the tops, and not to take roots, bases or bulbs.

On returning home after each trip, one takes care of the day's collections. If this job is postponed to the next day, the plants should be kept in a cellar or other cool place. They should be carefully removed from the vasculum and neatly arranged in drying papers. ..... In the center of each sheet, place one plant, or several if they are small, laying them out with care, and always without changing the natural direction of branches, leaves and roots. If the plant is very bushy, one may remove branches or leaves; if the stem exceeds the size of the sheet, it can be bent down at a sharp angle. One should not remove dead stalks or leaves which may be present at the base of the plant, on artistic grounds; these remains are of great value for study. ..... When first one tackles the job of drying, a thousand cares will be taken: the petals of each flower are spread out with the most scrupulous attention, the leaves separated from one another by slips of paper, etc.; finally a great deal of time will be consumed by a single specimen. Drying under such conditions becomes a very tedious job, able to repel the most courageous. Actually the extra pains are unnecessary: plants tossed on the drying sheets, stuck in bundles, lightly pressed at first, then gradually more strongly so, with frequent change of driers, are just about as well prepared as those dried with minute care. With a little practise, the drying of plants becomes easy, and one becomes able to dispose of large numbers of specimens rapidly and without excessive effort. .....

LIBRARY OF THE YOUNG BOTANIST

He who commences the study of botany is often faced with difficulty in choosing elementary books suitable for an introduction to the science. As if by a kind of fatal affliction, it is not at all rare to see him assemble a small library of quite mediocre books, or even plain bad ones. If he wishes to study botany as a simple amateur, the books listed below will suffice him, but if he plans to delve more deeply into some phase of the science, he will need to have a lot of other publications. I have listed works in different languages, for nowadays it has

become indispensable to know several foreign languages: the scholar or the serious amateur must consult the writings of botanists who use German, French, Italian, etc.

ELEMENTARY WORKS

DE JUSSIEU (Adrien). Cours élémentaire de botanique ... —A new edition is printed almost every year.
RICHARD (Achille). Nouveaux éléments de botanique et de physiologie végétale.
DE SAINT-HILAIRE (Auguste). Leçons de botanique.
DE CANDOLLE (A. Pyr.). Organographie végétale. — Physiologie végétale.
LINDLEY (J.). An introduction to botany.
LINNE. Philosophia botanica.
DE CANDOLLE (A. Pyr.). Théorie élémentaire de la botanique.
GERMAIN (Ernest). Guide du botaniste.

GENERAL WORKS ON THE CLASSIFICATION OF PLANTS

LINNE. Genera plantarum.
ENDLICHER (Steph.). Enchiridion botanicum.
LINNE. Species plantarum.
WILLDENOW (C.-L.). Linnaei Species plantarum.
ROEMER et SCHULTES. Systema vegetabilium.
SPRENGEL. Linnaei Systema vegetabilium.
DE CANDOLLE (A. Pyr.). Prodromus systematis naturalis...

Crépin's words are apt to be read with some condescension by the modern reader who, especially if he is a professional botanist, may find them naive and unsophisticated. But how many moderns, even with a bachelor's degree, would consider works of equivalent calibre to those by Linnaeus, De Candolle, and Lindley, in three different languages, suitable for beginners in botany? Yet Crépin was writing for persons who did not possess even the equivalent of a high-school education (at least in number of years of schooling). I have at hand a recent paper-backed booklet on American wild flowers, full of colored pictures, but with only sketchy and superficial descriptions, no keys, and not a single mention of a Latin name. What would Crépin have thought of such milk and water?

Late in the 19th century a sensitive English observer wrote that the United States had successfully solved its political and economic problems, but not the human one. Had Matthew Arnold been a botanist, he might have made some qualification, for in his day at least botanical study worthy of the name was a popular avocation, as attested by the wide sale of works by Asa Gray, Alphonso Wood, and Mrs. Lincoln (none of whom avoided Latin names, keys, or technical terms) to a public among whom college degrees were a rarity. Progress within technical fields is easily mistaken for universal progress.

In the often repeated comment of a famed though fictional Belgian detective, "It gives one to think."

CHARLES W. FALLASS (1854-1942), A PIONEER MICHIGAN BOTANIST[1]

Edward G. Voss

One hundred years after the birth of one of Michigan's finest amateur botanists would seem an appropriate time to bring together such facts as can be ascertained about his life and to bring the long-neglected work of Charles W. Fallass to the attention of a wider circle.

The earliest reference to Mr. Fallass in botanical literature appears to be in Emma Cole's *Grand Rapids Flora* of 1901, in which she mentions (p. v-vi) his herbarium and his assistance in the preparation of her catalog. Several of the lists of Michigan plants which have subsequently been published have acknowledged records from Fallass' work: Darlington, on Orchidaceae (1921); Kenoyer, on Umbellales and Ericales (1924); Gates and Ehlers, on the Douglas Lake region (1925, 1928, 1931, & 1948); Walpole, on Cruciferae (1927); Oosting, on *Potamogeton* (1932); and Walp, on shrubs (1935). Sargent (1907, p. 564) cites a *Crataegus* collection by Fallass. Darlington (1945, p. 37) refers to a manuscript list of the Emmet County flora by Fallass and Swift. Jones and Meadows (1948, p. 736) state that his collections are now in the Albion College Herbarium. These are all the references to Fallass which I have noted in botanical literature; there may be occasional citations in other works, but the number is doubtless small since he rarely distributed specimens to the larger institutional herbaria and his own herbarium has received comparatively little attention in recent years, even by Michigan botanists. Fallass published nothing himself.

It was originally intended to prepare only a brief account of the Fallass herbarium, with a few remarks about the man who assembled it. So helpful were those who could supply information, however, and so many were the statements made by those who knew him that here truly was a man worthy of biographical treatment, that the work has been considerably expanded. The life of Charles Fallass is, in a sense, typical of an era now past, and as such, worthy of record. Yet, in another sense, so outstanding were his accomplishments and the

[1]Contribution from the Biological Station of the University of Michigan.

quality of his life as to be well above the "typical," and so there is further reason for undertaking the present task.

ANCESTRY AND YOUTH; FALLASSBURG

Charles Wesley Fallass was born October 27, 1854, the second son of John Wesley and Phoebe Brown Fallass, of Fallassburg, Kent County, Michigan. Fallassburg remains today, a small settlement about three miles north of Lowell, on the Flat River near the eastern edge of Kent County. A county park has been established ("Fallasburg Park") occupying 81 acres, much of it wooded, along the west side of the Flat River just above the old covered bridge at Fallassburg. The 1954 "Road Map of Kent County, Michigan," issued by the Board of County Road and Park Commissioners, reproduces a photograph of the covered bridge on the front of the folded map; the name is spelled "Fallasburg." The county map of Kent County by the Michigan State Highway Department uses the spelling "Fallasberg." Local usage in the Grand Rapids region frequently corrupts the pronunciation to "Fallsburg." There seems to be little or no knowledge of the original settlers among residents of the area today.

Historical accounts do not exactly agree regarding the year in which John Wesley Fallass settled at the site of Fallassburg. The earliest published history of the region which I have been able to consult makes the following statement under the history of Vergennes Township (Dillenback & Leavitt, 1870, p. 100): "Among the early settlers may be mentioned the following: Silas S. Fallass, who settled in the year 1838, J. Wesley Fallass, in 1839, ..." Another early history states that Silas S. and J. Wesley Fallass settled in the spring of 1837 (Chapman & Co., 1881, p. 1368). Everett (1878, pp. 210-211) states that the mouth of the Flat River was one of the points of earliest occupation in the Grand River Valley. The first white resident, Daniel Marsac, came from Detroit for the purpose of trading with the Indians, and established a regular trading station in 1831. In October, 1836, four men from Scipio, New York, settled two miles up from the mouth of the Flat River; at that time there was no one resident but Marsac. Two more settlers came in 1836. "In their immediate vicinity," writes Everett, "and in intimate relations with them were three or four hundred Indians. ... Quite an influx of settlers signalized the year 1837, many of whom were transient. With regard to some there is doubt as to the date of their advent; the memory of the old settlers not altogether agreeing. We can without much hesitation place in this year: [sixteen, including] Silas Fallass, John W. Fallass. ... These took up land before it was surveyed."

The three works quoted above were all written while both of the settlers named were yet alive; Silas Fallass died in 1886 and his brother, John Wesley Fallass, in 1896. A later history (Fisher, 1918, p. 230) says: "J. Wesley Fallass was a native of Madison County, New York. He came to Kent County when a young man, in 1837, and located at what has since been known as Fallassburg, where he built a mill and early began the manufacture of lumber and flour. Going back to his native State, in 1842, he there married,[2] and with his bride returned to Vergennes township, and until the year 1875 continued to operate his mill. In that year he disposed of it to his sons and turned his attention to his farm, which he cultivated until his death, Nov. 5, 1896. He was the father of the late Henry B. Fallass, long a prominent lawyer in Grand Rapids." And, we must add, he was also the father of Charles W. Fallass. (There were no daughters.) Mr. and Mrs. J. Wesley Fallass "maintained a home of comfort and hospitality, which the relatives appreciated and where they loved to gather." (Alexander, p. 51.)

Although we cannot date it exactly, Fallassburg was evidently settled about 1837 or 1838. The family genealogy states that in 1845 William Fallass,[3] a brother of Silas S. and J. Wesley, moved with his wife "to Kent Co., Mich., making the long trip in covered wagons"; and that in 1839 Mr. and Mrs. William Fallass, their parents, had followed the children to Kent. Co. The town of Lowell, still an Indian village when Fallassburg was settled, was organized in 1848 (the name being changed from Dansville to Lowell in 1857). Its later growth at the mouth of the Flat River marked the decline of industry in Fallassburg, the up-river section of the Vergennes community.

It was in Fallassburg that Charles W. Fallass spent his youth, about which we know very little. His oldest daughter (June), writing of the grist mill which her grandfather had built in 1840, says, "Father used to tell me hair raising stories of swimming in the mill pond and riding logs when they came down the river (the Flat) in the spring." She continues: "He told about collecting gunpowder to explode under cans on the Fourth of July, which was always his favorite holiday—and he used to buy us all kinds of fireworks and turn us loose with no prohibitions on that day." He was very proud of the smoke house for hams and bacon which he built when he was twelve.

At the age of 14, he entered Albion College. He spent a semester at Ann Arbor, but was unhappy there and went back to Albion, where

[2]The Fallass genealogy states that he married Phoebe Brown on April 8, 1841.

[3]This William Fallass was the fifth generation to bear that name in America, his great-great-grandfather William having come to Boston from England some time prior to 1724.

he graduated (while only 18) in 1873.

"In his youth [he] displayed much ability as an artist" (Alexander, p. 66). A class note in the September, 1941, issue of "Io Triumphe," the Albion College alumni magazine, states that Fallass had on exhibit at an art show in Petoskey some oil paintings, one of which he had done at the age of 16.

POST-COLLEGE YEARS AND FIRST INTEREST IN BOTANY

Although it is now difficult to determine with certainty what Charles Fallass did during the first two decades after his graduation from Albion, the sequence of events was about as follows. He first taught school in Cedar Springs (Kent Co.). There he persuaded one of his pupils, Ida Estelle Sharer, to go to Albion— apparently an unheard of thing for a girl in that little community to do. She graduated from the college in 1882. On June 1, 1883, she and Charles W. Fallass were married in Cedar Springs. In the meantime, he had gone to Big Rapids (Mecosta Co.) to teach,[4] but presumably stopped teaching when he had saved enough money to study law. He was admitted to the bar but practiced for less than a year, for he loathed it. "Skullduggery," he called it, and stated that law and justice were two different things.

Next he went into the real estate business in Grand Rapids, and was very successful until the 1892-'93 panic. In 1893, he took his family to Cedar Springs, his wife's home town, where he bought an interest in a drug store. Here he stayed three years, after which he decided to return to his father's farm, which he still owned.[5] He had the old house in Fallassburg fixed up, and enjoyed life as a farmer. Mrs. Fallass, however, was not happy on the farm; in 1898 the family moved to Petoskey (Emmet Co.).

The Fallasses had four children: June (now Mrs. Charles M. Bergin, living in Arlington, Virginia); (Mary) Marguerite (now Mrs. Clyde M. Barber, Dowagiac, Michigan, and going by the name of Margaret); Charles Henry (now of Cross River, New York); and Carol (now Mrs.

[4]Newspaper accounts at the time of his death and at the time of acquisition of his herbarium by Albion College state that he taught at Ferris Institute in Big Rapids. However, President Victor F. Spathelf of Ferris Institute writes me: "We have made an extensive search of institutional records and we can find no record of a Mr. Charles W. Fallass having taught at Ferris Institute." Almost all his specimens from Big Rapids were collected in April, May, and June of 1881. The Institute was not founded until 1884.

[5]As previously noted, a historical account states that in 1875 J. Wesley Fallass turned over his mill to his sons. Neither son must have worked at the mill or the farm for long, since Henry B. became a lawyer in Grand Rapids. Perhaps it was this example which had led Charles, eight years his junior, to take up law.

Leslie Wolfenden, San Francisco, California). All were exceedingly healthy children and were successfully reared with a very minimum of discipline.

There seems to be no definite information now available as to exactly how or when Fallass became interested in botany, although some promising guesses are possible. Dr. Charles H. Swift, who was associated with him for almost 40 years in his botanizing in Emmet County, tells me that Fallass said his interest had been aroused through the study of drug plants— many more drugs in those days being directly of botanical origin. His son, C. Henry Fallass, writes: "I seem to recall my father once saying that his interest in botany was first aroused by the influence and example of his second cousin, Mary Brown, who was seven or eight years his senior and who eventually married my father's older brother, Henry B." So perhaps both the interest of his second cousin (sister-in-law) and an original interest in pharmaceutical botany combined to lead Charles Fallass to take up the avocation seriously. Another factor, which I am strongly tempted to believe may have gotten both Mary Brown and Charles Fallass interested at the very beginning has been suggested by Mrs. Bergin, who writes me: "There was a Miss Cole living at my uncle's in Grand Rapids. . . and I think she first aroused his interest in collecting."

Miss Emma J. Cole[6] (1845-1910), author of the *Grand Rapids Flora*, taught at Central High School in Grand Rapids from 1881 till her retirement in 1907. Prior to that, she taught at Lowell and Greenville; and before that, for four years in the country school at Vergennes which she had earlier attended as a pupil. Perhaps here one of her students was Charles Fallass; if we had more dates we might know. At any rate, the fact that she lived at the home of Henry B. Fallass makes important the probability of her influence on Henry's wife, Mary Brown, and on his brother, Charles.

Henry B. and Mary Brown Fallass had one daughter, Florence.[7] Both Mary and her daughter were interested in botany, kept herbaria of their own, and would send specimens of interest to Charles. He has mentioned "my sister Mary" as the source of specimens on a number of his herbarium sheets; she provided him with material from several localities in Europe, as well as elsewhere. Mary Fallass' herbarium

[6]Data about Miss Cole are taken from a 6-page duplicated leaflet prepared in 1941 by Arlene I. Whittemore and distributed to holders of the Emma J. Cole Fellowship in Botany at the University of Michigan. (It was my privilege to hold this fellowship for the year 1953-54.)

[7]The genealogy by Alexander gives her name as "Phoebe Florence"; her own herbarium labels read "Herbarium of Florence P. Fallass" (or sometimes simply Florence Fallass). In any event, she apparently went by the name of Florence.

is referred to by Emma Cole in the *Grand Rapids Flora* (p. v). And it can hardly be doubted that it is her name for which the initials "M. B. F." stand after a poem and illustration of witch hazel facing page 160, at the end of the text of that volume.

Mrs. C. M. (June Fallass) Bergin has most generously sent me her father's copy of the sixth (1889) edition of Gray's Manual of Botany. It is copiously supplied with marginal notes giving dates and localities in her father's hand. These must be used with caution, however, for they constitute a record of specimens in his herbarium, including exchanges, not merely his own collections. The earliest records supported by specimens collected by Fallass himself are numerous ones for 1880, all from August 2 through 30, except for three in July (7, 12 and 28). These are all accompanied by the initial "F," for Fallassburg. There is a record from Cedar Springs, August 17, 1880, and several species are noted from Cedar Springs in 1881 and later years, the last being in June of 1897. The only records from Big Rapids are the 1881 ones mentioned in note 4 above. There are many records from Fallassburg beginning with July of 1881 and from Grand Rapids beginning in June of 1881. There are no dates after 1897 (except for two in 1898); evidently after moving to Petoskey in 1898 he stopped recording data in this manual. His copy of the seventh (1908) edition of Gray's Manual is with the herbarium at Albion. It includes not only the marginal notes as entered in the sixth edition, but also carries the notations up to 1934, after which he did almost no collecting. In this edition, he indicated the source of specimens which had been collected by others, so the volume is a useful index to his collecting and exchanges as well as to the herbarium.

In a letter written by Fallass to Dr. A. M. Chickering, of Albion, on May 18, 1935, he said: "I must confess however that I am not giving as much time to botany as I gave to it during most of the sixty years that it [the herbarium] was accumulating." If taken literally, this would place his earliest collections no later than 1875. It may be that his interest came before he left Albion in 1873, although the specimens now extant appear to begin in 1880.

EMMET COUNTY; FALLASS AND SWIFT

C. W. Fallass was one of several collectors active in Kent County in the latter part of the 19th century. When he began collecting in Emmet County, however, he was in territory almost completely unknown botanically. For 22 years (until the establishment of the University of Michigan Biological Station in 1909), his was the only continuing botanical work at the northern tip of the Lower Peninsula of

Michigan. It is primarily for his work on the Emmet County flora that he became known among Michigan botanists in the present century.

The year 1887 was the second season of the Bay View Assembly, and the *Bay View Assembly Herald* for April of that year (Vol. 1, No. 4, p. 5) predicted that "At least fifty and perhaps seventy-five cottages will be erected this year at Bay View." One of them was the cottage[8] of C. W. Fallass, who came to join the growing community at the eastern end of Little Traverse Bay, first organized in 1875 as "The Michigan Camp Ground Association of the Methodist Episcopal Church"—now the "Bay View Association."[9] Entered at the back of his copy of Gray's Manual, seventh edition, is a list of the plants growing on his cottage lot in 1887. It numbers 81 species; 14 additional species are listed which had been transplanted to the lot and were growing there in 1924. The earliest Bay View dates entered in his copy of Gray's Manual, sixth edition, are for July 10 and July 27, 1887.

In 1898, Fallass left the farm in Fallassburg and moved that summer to Petoskey, the county seat of Emmet County, on the south side of Little Traverse Bay, adjacent to Bay View (where he still maintained his summer cottage). In Petoskey, he entered into partnership with Coburn and Harner, who, according to an advertisement in the Bay View Assembly Program for 1897, had dealt in books, stationery, and news; fishing tackle, northern views, medallions, sporting goods, daily newspapers, and all periodicals; Kodaks and supplies. In time, Fallass became sole owner of the business, and for many years "The Fallass Drug Store" on the corner of Mitchell and Howard streets in Petoskey was one of the city's leading business establishments.

In 1927 Fallass sold out to John Lake, who had been in the meat and grocery business in Petoskey. "The Lake Drug Company, Successors to the Fallass Drug Store" eventually moved to the middle of the block on Mitchell Street; Lake later established a paint and wallpaper business, and the drug store is no longer in operation.

The Fallass home, on the southeast corner of Williams and Bay streets in Petoskey, was a large, three-story frame house, excellently furnished; it was in a room here that the herbarium was kept.

An active member of the First Methodist Church of Petoskey, Fallass served for many years on its committees and boards. He was

[8]On Lot 17, Block 39.

[9]For the history of Bay View, see the recent volume compiled by Clark S. Wheeler. The first cottages in Bay View were built in 1877.

Charles W. Fallass. Date unknown, probably about 1900.

a faithful trustee of the Bay View Association from July 27, 1904, to August 2, 1939, and hardly ever missed a meeting. From 1914 to 1922, he was secretary of the Association, and from 1928 to 1939 he served as vice president. When he retired as a trustee, he was elected by the cottage owners as a "trustee emeritus." He had served Bay View in an official capacity longer than anyone else in its history.

In her genealogy of the Fallass-Fallas and allied families, Lura Fallas Alexander gives C. W. Fallass first mention in her preface as having been of help, and in the short entry after his name she states

(p. 68): "He has kept family records with the same careful concern with which he has carried on his business, and has sympathetically responded when called upon for family dates, and early traditions."

The Fallass Drug Store might have been a less successful business, due to the devotion of its owner to botany and to the affairs of the Bay View Association, had it not been for the faithful clerks and pharmacists employed. On December 1, 1919, Virgil Barmore, a registered pharmacist, came to work for Fallass, joining Joseph B. Seward, who had been employed some years before and in whose hands the store had been left during the many botanizing trips which Fallass took whenever a friend could persuade him to go out. Mr. Seward is no longer living, but Mr. Barmore still resides in Petoskey and recalls how he would take care of the store while Fallass went botanizing with someone, taking Joe Seward to drive them to a suitable collecting site.

His earliest botanizing in the region was, of course, done on foot or was aided by train travel to nearby localities. He did not use a horse. He early acquired a car, which facilitated travel. Fallass almost always carried his vasculum with him—one with a handle rather than a shoulder strap—and a small trowel. Sometimes he also took a press into the field (His field portfolio is now with the herbarium at Albion.) Many trips were affairs lasting most of the day, and he would sometimes carry his lunch in his vasculum. After returning home, he placed his plants between single sheets of newspaper separated by thick blotting paper, roping the press of wooden slats tightly together. Newspapers were changed as the plants dried.

In much of his botanical work in northern Michigan, Fallass had the collaboration of Dr. Charles H. Swift, whose name is frequently associated with his. Dr. Swift, Associate Professor Emeritus of Anatomy at the University of Chicago, has spent his summers at Bay View since 1899. Although he had heard of Fallass, he had never seen him before the first of July, 1903. Then, he writes, "I had been collecting plants in a sphagnous swamp and wood beyond, i. e. west of, Harbor Springs. On the way out I met a man near the Indian village carrying a vasculum; I had one over my shoulder. We at once struck up an acquaintance which lasted for nearly forty years. ... From that time we saw each other frequently. At first we went by the then frequent trains to various parts of the county (Emmet) or walked. In this way we visited lakes, lake shores, swamps, and dunes in the region of Harbor Springs, Bay View, Oden, Carp Lake, and Mackinaw City. When he got an auto we could get out better and went all over the county. I am ashamed to think of the times I took him away from his drug store, but he was always willing. ... He was tireless and on

these trips he hated to leave the collecting field."

An enthusiastic botanist by avocation, Swift did not make herbarium specimens for himself. Whatever specimens of his have been preserved went into Fallass' herbarium.[10] Swift was only interested in identification; once he knew a plant and noted it in his manual he preserved no specimen. It was Swift, however, who suggested to Fallass the idea of a list of the county flora. It was met with enthusiasm, and in the fall of 1918 Swift made up a list in a notebook and sent it to Fallass for additions. Two pages of this original list, kindly lent me by Dr. Swift, are reproduced herewith. The composite list was then copied by Swift and sent to W. J. Beal at Michigan State College. Beal wrote Swift that he intended to incorporate the data in the next edition of his list of the Michigan flora (Unfortunately, there has not been another edition of the "Michigan Flora" since 1904.) Another copy of the entire list in Swift's hand is in a notebook with the herbarium at Albion. In this copy, Fallass had added annual additions through 1934, the last entry being numbered 1125. He also indicated where these additions would be entered in taxonomic order, and noted at the beginning of the list that adjacent portions of Cheboygan and Charlevoix counties were included in the area covered.

It was evidently Fallass' copy of the list (the copy now at Albion) which was made available to Gates and Ehlers at the University of Michigan Biological Station, on Douglas Lake in neighboring Cheboygan County. The list is referred to and some records from it are cited in Gates and Ehlers' reports on the flora of the "Douglas Lake Region"—Emmet and Cheboygan counties. Dr. Gates has recently placed in the Biological Station library a carbon copy of this typed copy of the Fallass and Swift list; another carbon copy was apparently given to Fallass, for it is with the herbarium at Albion. The copy in the Biological Station library includes the annual additions through 1922. Considering the number of times that it has been copied, it is not entirely unexpected that there are some minor differences between the text of the original composite manuscript and the copy in the Station library. Dr. Swift estimates that Fallass added approximately fifty per cent more species to his (Swift's) original manuscript list. The total list, as of 1918, included about 800 entities. Gates and Ehlers utilized it for Emmet County records when they had found a species only in Cheboygan County. They did not (with few exceptions) quote it as a source for Emmet County records alone, nor did they consult Fallass' herbarium in preparing their lists of Emmet and Cheboygan county plants.

[10] *Habenaria psycodes* var. *varians* and var. *ecalcarata* were described by Bryan (1917) from specimens collected on the north and west sides of Round Lake (northeast of Bay View) by Swift and sent by him to Greenman at the Missouri Botanical Garden.

Mr. and Mrs. Charles W. Fallass on their 50th wedding anniversary, June 1, 1933. He was 79 and she, 75.

Fallass was a very cautious man, according to Dr. Swift, and if he were not certain of an identification in the field would withhold judgment until he could return home and check the specimen thoroughly. In a letter written in May of 1935, Fallass referred to a collection of over 200 specimens he had made that winter in Arizona and which were determined for him at the University of Arizona: "I shall reexamine all of these, as has always been my practice with exchanges."

In the 1930's, Fallas became troubled with tic douloureux. He entered the University Hospital in Ann Arbor on April 27, 1936, where he was operated on the next day by Dr. Max Minor Peet, famed neurosurgeon (and ornithologist). The operation eased much of the pain, but substituted an inevitable numbness on the affected side of his face. At this time his memory also seemed affected—a memory which has been described: "He had one of the finest minds I ever knew and a prodigious memory---I never remember his having forgotten anything he ever knew." The effects of age were becoming apparent. He had not driven a car since he was eighty. And the botanizing ceased.

In October of 1942, about 12 days before his death, he was brought by ambulance to the home of his daughter Margaret Barber, in Dowagiac, where it was thought his health would improve. On the afternoon of November 5, 1942, he passed on at the age of 88—the end of a long and useful life. Mrs. Fallass, who had also been unwell, died at Mrs. Barber's home on May 11, 1943.

Statements which have been made to me by Petoskey and Bay View residents as I have been gathering data show the esteem in which the memory of Charles W. Fallass is held: "He was a fine man, an excellent husband, and a devoted father." "Mr. Fallass was held in highest esteem in Bay View and Petoskey. He loved Bay View and gave much of himself to the Association." "He was the last word of integrity and honesty; I can't speak highly enough of him." John Lake, who bought his business in 1927, pointed out that there had been no written agreement on the transaction—and that none was needed in dealing with a man of the integrity and character of C. W. Fallass.

THE FALLASS HERBARIUM

Fallass mounted his specimens on sheets of good cardboard (rather than heavy paper) 11 1/4 by 17 1/4 inches in size, using narrow strips of gummed cloth tape. In the case of small plants, two or more collections were frequently mounted on the same sheet, numbered (1, 2, 3, etc.) to correspond with data entered (very concisely and often much abbreviated) on the label in the corner. One label sufficed for all

I first called this C. laurentiana sang
but with much misgiving. Upon more
careful ex-n I am, at least somewhat more
certain that it is Brainerdi Sarg and I think
the Egglestoni var.

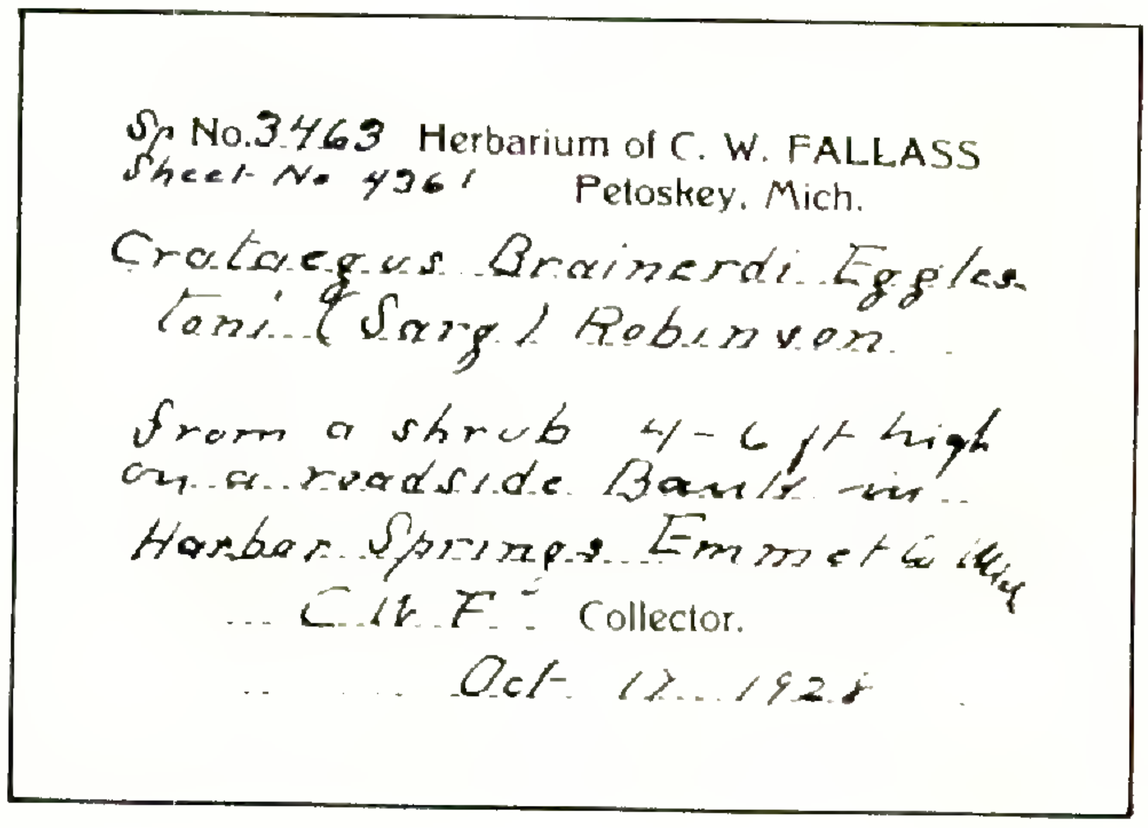
1st The leaves are distinctly impressed-veined
2nd the calyx lobes are only serrate not deeply cut
3rd the nutlets have only shallow pits on
their ventral faces These characters
place it in the Brainerdianae or Anomalae
group
4th the fruit is short- ellipsoidal and not to
exceed 1cm diameter and cherry-red and
acid
5. The nutlets are only 2-3 and this is
correct for the var. (Gray ?). Of
the 3 fruits that I examined 2
had only 2 nutlets each and one had 3
6th The leaves are apparently distinctly
Coriaceous which is also correct for
the var Eg. ... spec. came from
a shrub 4-6 ft high. I think upon
the whole therefore that these
characters are sufficiently distinctive
to warrant calling this spec.
C Brainerdi Egglestoni (Sarg) Robinson.
11/25/28 F

A characteristic note attached to a herbarium sheet of *Crataegus* (this specimen proves actually to be *C. succulenta* ; det. confirmed by E. J. Palmer, 1953).

collections on a sheet; data for collections affixed later were added between the lines of the original label.

When there was more than one sheet of the same species, they were tied together with several little loops of string serving to bind the left margin. Over each individual sheet or group of sheets was placed a thin tissue fly-leaf attached at the left by bits of gummed tape. Older specimens often bear "Correction Labels" bringing the nomenclature in line with later editions of the manuals. Many sheets have attached to them notes written by Fallass explaining his determinations and calling attention to the reasons for and against deciding upon a certain determination. These are often very detailed, and their presentation is in an argumentative style which brings to mind Fallass' earlier days as a lawyer.

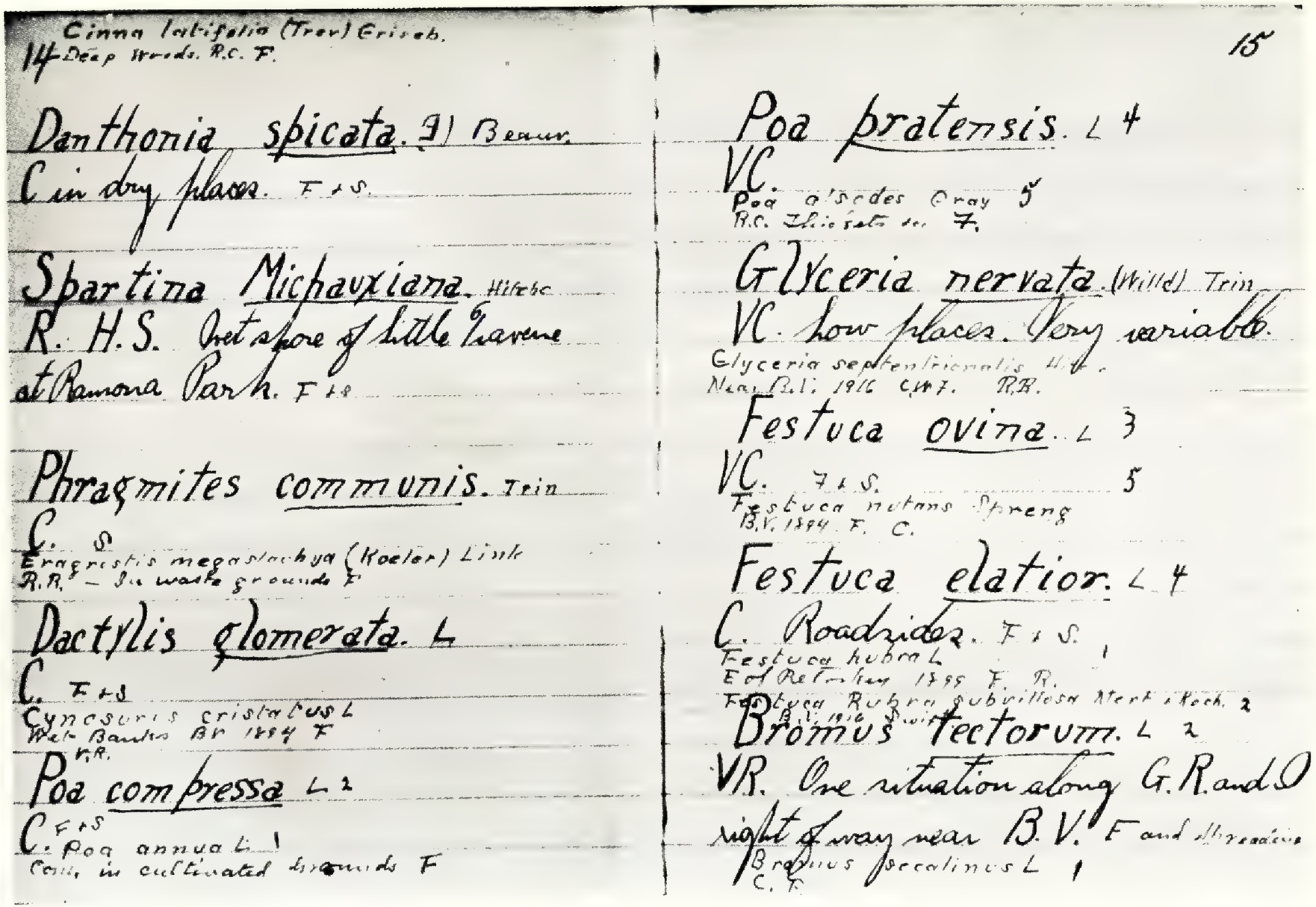
Several groups in the herbarium were examined by specialists or students: *Potamogeton* has been annotated by Henry J. Oosting; *Amelanchier* (eastern species), by K. M. Wiegand in 1924; the Compositae have been examined by S. E. Wolff. All *Salix* specimens were annotated by C. R. Ball in 1943; the Michigan Gramineae have been recently examined by N. W. Katz; and Stanley Cain checked the Pteridophytes in 1950 for Billington's posthumous *Ferns of Michigan*. I have annotated [1953-54] a number of the Emmet and Cheboygan county specimens [and a few others], and have sent several sheets of *Carex*, *Crataegus*, and *Aster* to F. J. Hermann, E. J. Palmer, and L. H. Shinners, respectively, for checking. In addition, individual sheets sometimes bear notes giving the opinions of others, and letters from men to whom specimens were sent for determination may be filed with the appropriate material.


Sp No. 3463 Herbarium of C. W. FALLASS
Sheet No 4361 Petoskey, Mich.

Crataegus Brainerdi Eggles.
toni (Sarg.) Robinson

From a shrub 4-6 ft high
on a roadside Bank in
Harbor Springs Emmet Co Mich
C.W.F. Collector.
Oct 12 1928

The herbarium label from the sheet to which the note shown in the previous figure was attached.



Cinna latifolia (Trev) Griseb.
14 Deep Woods. R.C. F.

Danthonia spicata. 3) Beauv.
C in dry places. F + S.

Spartina Michauxiana. Hitchc
R. H.S. Wet spore of little Traverse
at Ramona Park. F + S

Phragmites communis. Trin
C. S
Eragrostis megastachya (Koeler) Link
R.R. — In waste grounds F

Dactylis glomerata. L
C. F + S
Cynosuris cristatus L
Wet Banks BV 1894 F
V.R.

Poa compressa L 2
C. F + S
Poa annua L 1
Com. in cultivated grounds F

15

Poa pratensis. L 4
VC.
Poa alsodes Gray 5
R.C. Thickets &c. F.

Glyceria nervata. (Willd) Trin
VC. Low places. Very variable.
Glyceria septentrionalis Hitc.
Near B.V. 1916 C.W.F. R.R.

Festuca ovina. L 3
VC. F + S. 5
Festuca nutans Spreng
B.V. 1894. F. C.

Festuca elatior. L 4
C. Roadsides. F + S. 1
Festuca rubra L
E of Petoskey 1899 F. R.
Festuca Rubra subvillosa Mert + Koch. 2
B.V. 1916 Swift

Bromus tectorum. L 2
VR. One situation along G.R. and I
right of way near B.V. F and spreading
Bromus secalinus L 1
C. F.

Two pages from the original Fallass and Swift manuscript list of the Emmet County flora. The larger writing is Swift's.

Fallass carried on exchanges with many collectors, and the herbarium includes specimens from the Biltmore Herbarium, C. C. Deam, Branson A. Walpole, Homer C. Skeels and Jennie Shaddick ("Our Herbarium"), E. E. Sherff, J. M. Grant, D. Potter, Earle Mulliken, A. A. Heller, and many others. There are a number of early collections by Emma J. Cole, including some from New York and Colorado as well as from Michigan. Fallass' own collections are from all parts of the United States, with considerable material from Arizona and Florida (apparently collected in large part after his retirement, although his first trip to the west coast was in 1915). Only a very few of the ubiquitous specimens of C. K. Dodge are included. Many local people would leave specimens with Fallass to be identified, sometimes depositing them on his desk in the drug store; some of these have found their way into the herbarium. There is a small amount of European material.

As has been mentioned before, the Fallass herbarium is now at Albion College, Albion, Michigan. It constitutes almost the whole college herbarium, and has been safely housed in four standard steel herbarium cases.

The herbarium was given to Albion after Fallass' death. Apparently he had not made specific provision in his will for its disposition, but this was known to be his wish. A letter written to Professor A. M. Chickering, chairman of the biology department of Albion, on May 18, 1935, states: "As to the herbarium I do not know of any reason why Albion should not have it *when I am through with it* which may be several years hence for I am only ! 80 and 'still going strong.'"
In a letter to Dr. G. W. Prescott, then of the Albion biology faculty, Fallass wrote on January 29, 1939: "I spent so many years accumulating it that it has almost become a part of myself and the wrench of parting with it would not be easy. I do not forget that I cannot take it with me but I also know that it would be much easier for my family to part with it than for me. I have talked the whole matter over with Mrs. Fallass and we are in entire agreement that the herbarium should remain where it is until our home is finally broken up. That event cannot, in the nature of things, be very far in the future. She is 80 and I am 84 years old and no matter which one of us goes first the survivor will be ready . . . to let the herbarium go to its final resting place, which, so far as I can see is the old college of which we are both graduates - I in 1873 at the age of 18, and my wife in 1882."

Given by the Fallass estate to Albion College, the herbarium was packed up in the spring of 1943 by Dr. Prescott, who went to Petoskey for the purpose. In 18 large packing cases the collection arrived on campus in early June, 1943. For a while it was housed in the three

glass-doored oak cabinets in which Fallass had kept it. (A few cryptogamic specimens collected by Emma Cole remain in one of the oak cabinets; Fallass evidently did almost nothing with non-vascular plants.) With the herbarium, Albion was given over 20 of Fallass' botanical books; these include such choice items as Howell's 1903 *Flora of Northwest America* and Rydberg's 1917 *Flora of the Rocky Mountains and Adjacent Plains*. His copy of Beal and Wheeler's 1892 "Michigan Flora" contains abundant marginal annotations; the other works have a few notes.

In his letter to Dr. Chickering, May 18, 1935, Fallass makes an interesting evaluation of the cost of the physical part of the herbarium:

"The 3 oak cases cost in cheap times not far from 50.00 each	150.00
The card board I used cost 3 to 3 1/2 ¢ each. (After several trials I found that nothing but the finest card board I could buy would answer) 5000 sheets	150.00
Fly sheets to protect from dust & which no other herbarium has	25.00
Books, labels, genus covers, etc. about	100.00
	425.00 "

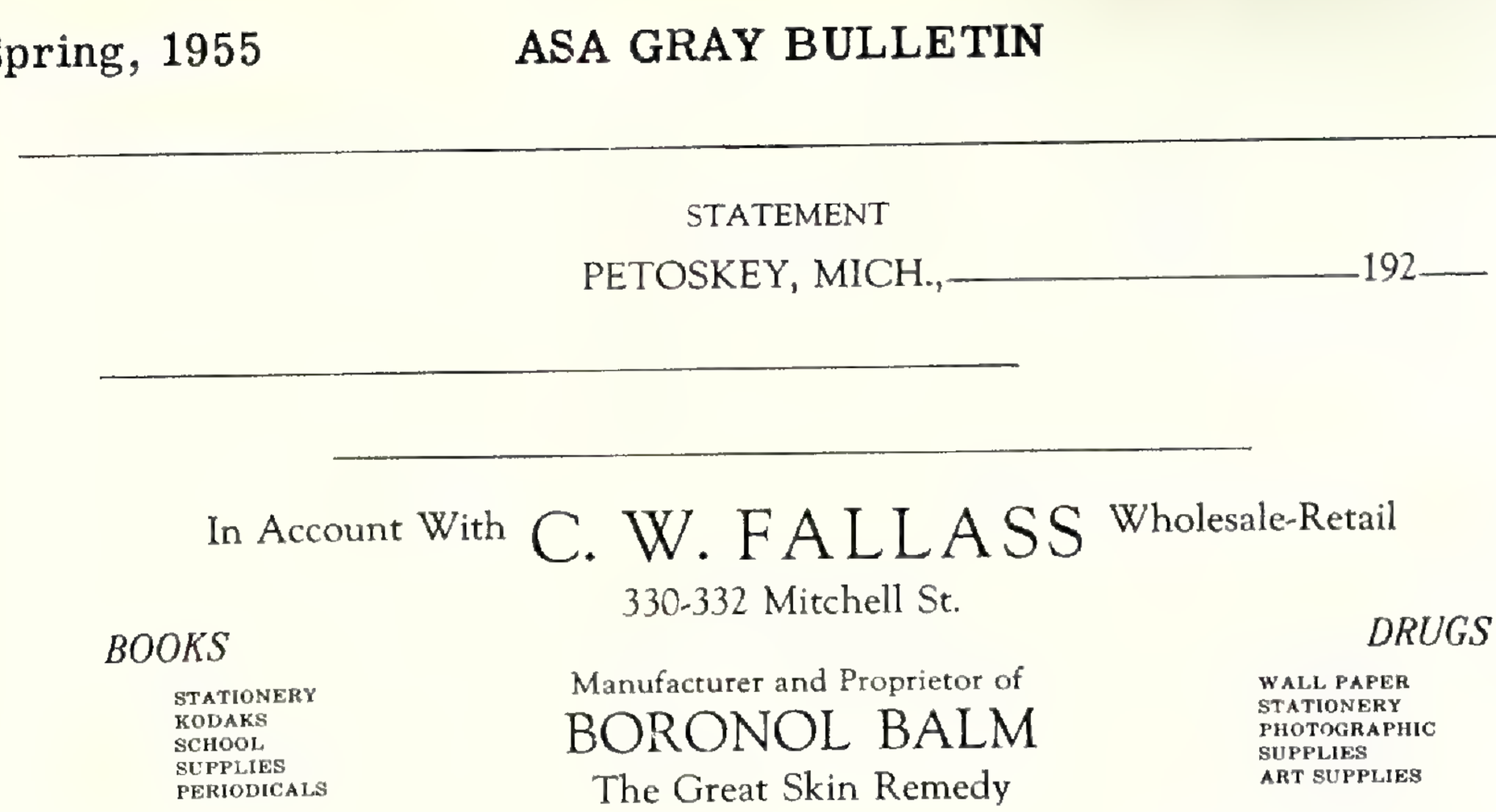
Dr. William J. Gilbert, who is now in charge of systematic botany at Albion, states that a student counting the number of sheets in the Fallass herbarium found a total of 5694. Since more than one collection is often mounted on a sheet, the total number of specimens might approach the 10,000 estimate publicized at the time the herbarium was given to Albion. As implied in the course of the preceding pages, the collection is a valuable one, particularly regarding the Michigan flora. Very few Fallass specimens are in the herbarium at Michigan State College or that of the University of Michigan. It should be pointed out, however, that not all species on the Fallass and Swift manuscript list are supported by specimens (whether or not correctly determined) in the herbarium. On the other hand, there are supporting specimens for a number of species which are very rare or otherwise unknown in the State (*e.g.*, *Psilocarya scirpoides* and *Senecio congestus* var. *palustris*).

One difficulty which users of the herbarium may encounter is interpreting the often cryptic data on the labels. Many localities are much abbreviated (*e.g.*, C. S. = Cedar Springs; B. V. = Bay View; Pet. = Petoskey; B. R. = Big Rapids; F. = Fallassburg). Local names are frequently given without county designation. Localities such as

Menonaqua, Roaring Brook, and Wequetonsing are indicated on detailed Emmet County maps today along the shore of Little Traverse Bay. "Paige," where Fallass did a great deal of collecting, is not on maps and does not consist today of even so much as a remnant of the old bath house which once was there; it is just north of Menonaqua Beach, along the shore. A 1902 county plat book in the County Clerk's office in Petoskey is of help in locating extinct sites. Those familiar with localities frequented by members of the University of Michigan Biological Station must undergo some reorientation: *e.g.*, Fallass' "Mud Lake" is a small body of water between Round Lake and Bay View, not the familiar bog northeast of Douglas Lake; his "Mill Creek" is in Kent County, not southeast of Mackinaw City in Cheboygan County. A few errors of county designation occur or are implied: "Pine barrens east of Petoskey" would have to be in Cheboygan County, for the jack pine association is not developed anywhere in Emmet County; the "shore of Burt Lake" cannot be in Emmet County, as occasionally stated.

Fallass' numbering systems make it difficult to cite specimens by number. Evidently he had two series, one for herbarium sheets and one for specimens. As shown on the label illustrated above, both are sometimes given. Occasionally one is given. Often a number appears at the top of the label, without any indication as to whether it is a "sheet number" or a "specimen number." Often there is no number. There are no notebooks extant—if they ever existed—with his field notes and collection numbers in chronological order, although some early herbarium numbers are recorded in the back of his copy of Gray's Manual, sixth edition, and a few other lists or portions of lists are stored in one of the old oak cabinets at Albion.

As to the quality of the specimens and the accuracy of their identification, Dr. F. J. Hermann, of the U. S. Department of Agriculture, wrote the following comment when returning several assorted sheets of *Carex* which had been sent to him for checking: "His collections show painstaking work, and he did a very creditable job in their identification considering the limitations under which he had to work." In a master list of the Emmet and Cheboygan county flora which I have recently prepared, approximately 35 species (or 3% of the flora) are known thus far from the entire region *only* on the basis of specimens in the Fallass herbarium. The proportion for Emmet County alone would be considerable higher. Considering the fact that botanists from the University of Michigan Biological Station have worked in the region since 1909, the thoroughness of the work of C. W. Fallass is evident.


STATEMENT

PETOSKEY, MICH.,_____192__

In Account With C. W. FALLASS Wholesale-Retail

330-332 Mitchell St.

BOOKS

STATIONERY
KODAKS
SCHOOL
SUPPLIES
PERIODICALS

Manufacturer and Proprietor of
BORONOL BALM
The Great Skin Remedy

DRUGS

WALL PAPER
STATIONERY
PHOTOGRAPHIC
SUPPLIES
ART SUPPLIES

Heading of a statement indicating the scope of merchandise handled by the Fallass Drug Store. Wallpaper was one of his major commodities.

ACKNOWLEDGMENTS

It is a pleasure to express my heartfelt appreciation to all those who made this biographical sketch possible, whether by supplying information or, equally important, directing me to sources and people who could help. I should mention first of all C. W. Fallass' son and daughters. C. Henry Fallass, June Fallass Bergin, and Margaret Fallass Barber have patiently responded to my several letters. Mrs. Bergin has kindly lent the photographs reproduced above. Several residents of Petoskey and Bay View generously shared their recollections by letter or in personal conversation: Mr. Virgil Barmore, Mr. C. W. Christopher, Mr. Chalmers Curtis, Sr., Mr. John Foley, Mr. John Lake, Dr. Charles H. Swift, and Bishop Raymond J. Wade. Others without whose assistance this account would have been less complete include the staff of the Bay View Library; Mr. Claude L. Barkley, Deputy Clerk of Kent County; Mr. Kenneth J. Hollinshead, Executive Secretary, Albion College Alumni Association; Mr. Kees Lems, of Ann Arbor, who was able to visit Fallassburg for me; Dr. G. W. Prescott, of Michigan State College (formerly of Albion); Mr. John E. Rutherford, of Lowell, Michigan (who lent me the Fallass genealogy); and Mrs. Thomas J. (Katherine Foley) Ward, of Mackinaw City (formerly of Petoskey). Dr. William J. Gilbert, of Albion College, has been most helpful and gracious in searching for information as well as facilitating my study of the herbarium.

REFERENCES

Alexander, Lura F. 1929. Genealogy. Descendants of William and Dorcas Fallass . . . [Cover title is "Fallass - Fallas and Allied Families -- Genealogy"] Compiled, edited and published by Lura F. Alexander. Kansas City, Mo. 325 pp.

Bay View Bulletin. May 1943. Charles W. Fallass [Obituary notice]. (Bay View Bull. 25 (3): 17.)

Bryan, Mary M. 1917. A Spurless Variety of Habenaria psycodes, Ann. Mo. Bot. Gard. 4:37-42.

(Chapman & Co.). 1881. History of Kent County, Michigan . . . Chicago: Chas. C. Chapman & Co. 1426 pp.

Cole, Emma J. 1901. Grand Rapids Flora. Grand Rapids: A. van Dort. 170 pp.

Darlington, H. T. 1921 ["1920"]. Distribution of the Orchidaceae in Michigan. Rep. Mich. Acad. Sci. (for 1919) 21:239-261.

--------. 1945. Taxonomic and Ecological Work on the Higher Plants of Michigan. Mich. Agric. Exper. Sta. Tech. Bull. 201. 59 pp.

Dillenback & Leavitt (compiled & published by). 1870. History and Directory of Kent County, Michigan . . . Grand Rapids: Daily Eagle Steam Printing House. 318 pp.

Everett, Franklin. 1878. Memorials of the Grand River Valley. Chicago: The Chicago Legal News Company. 545 + 74 pp.

Fisher, Ernest B., ed. 1918. Grand Rapids and Kent County, Michigan. Historical Account of their Progress from First Settlement to the Present time. Vol. I. Chicago: Robert O. Law Co. 566 pp.

Gates, Frank C., & J. H. Ehlers. 1925. An Annotated List of the Higher Plants of the Region of Douglas Lake, Michigan. Papers Mich. Acad. Sci., Arts, Letters (for 1924) 4:183-284.

--------. 1928. Additions to an Annotated List of the Higher Plants of the Region of Douglas Lake, Michigan. *Ibid.* (for 1927) 8:111-120.

--------. 1931. do., II. *Ibid.* (for 1930) 13:67-88.

--------. 1948. do., III. *Ibid.* (for 1946) 32:27-46.

Jones, George Neville, & Edna Meadows. 1948. Principal Institutional Herbaria of the United States. Amer. Midl. Nat. 40:724-740.

Kenoyer, L. A. 1924. Distribution of the Umbellales in Michigan. Papers Mich. Acad. Sci., Arts, Letters (for 1923) 3:131-165.

--------. 1924. Distribution of the Ericales in Michigan. *Ibid.* (for 1923) 3:166-191.

Oosting, Henry J. 1932. Distribution of the Genus Potamogeton in Michigan. *Ibid.* (for 1931) 15:141-171.

Sargent, C. S. 1907. Crataegus in Southern Michigan. State Board Geol. Surv. Rep. 1906: 509-570.

Walp, Russell Lee. 1935. Shrubs of Cheboygan and Emmet Counties, Michigan. Amer. Midl. Nat. 16:230-247.

Walpole, Branson A. 1927. Distribution of the Cruciferae in Michigan. Papers Mich. Acad. Sci., Arts, Letters (for 1926) 6:307-349.

Wheeler, Clark S. n. d. Bay View. A History . . . from . . . 1875 to . . . 1950. Bay View: Bay View Association of the Methodist Church. 179 pp.

PHILIPPINE JOURNAL III[1]

Pierre Dansereau

531126. - MANILA - LOS BANOS

A sparkling day for the pan-congress excursion to Los Baños. A welcome break. My former student, Albert Stage (on duty here) joins me. No time wasted on reminiscing about the beauty of Michigan oaks and the Bitterlich method of basal area measurement. Not with *Barringtonia* and dipterocarps about. Al has had good luck, visiting Mindanao forests; has also done some underwater colour photography successfully.

The College of Agriculture and Forestry is at the foot of Mount Makiling. Buildings in a beautiful setting of planted trees: native Dipterocarpaceae, and large specimens of *Hura crepitans*, *Beaumontia grandiflora*. The African *Spathodea campanulata*, its vermilion blossoms, reminds me of the landscaped avenues of Rio.

We drive through carefully tended grounds and follow a narrowing road upslope. The orderly grove replaced by jungle, the gravel by mud. The bus, stranded in a slippery curve, stalls. We jump out, glad at last to touch natural vegetation. A detachment of soldiers, olive-green and smiling, accompany us. Mountain still infested with Huks? We may not go to the top. Also, there is hardly time. Al and I follow in the footsteps of Mr. Sulit, who once taught at the Forestry School and knows the flora well. Make notes and collect. Something acquired, it seems at the mere touch of a leaf. The snapping of the stem makes this definitely yours. The careful spreading of the inflorescence on the sheets in the press graves the image in your mind.

This is jungle: many scattered, tall trees, remnants of the primeval forest (destroyed by Japanese and Americans) and dense undergrowth, of smaller trees, palms, lianas, bamboos, weeds on the roadside. But even weeds are interesting.

[1]See Asa Gray Bulletin, N.S. 2:323-330, 419-438. 1953 [1954].

Many of the second-growth heliophilous trees have large peltate leaves: *Macaranga bicolor, M. gigantifolia, Homalanthus populneus, Endospermum peltatum;* so do vines such as *Merremia peltata.* On the contrary the "laurel" type prevails among the tall, straight-trunk rainforest trees: *Canarium luzonicum, Hopea* (*foxworthyi* ?), *Parashorea plicata, Nothophoebe malabonga, Leucosyke capitellata, Ficus variegata, F. nervosa.* There are many other species of fig (*F. odorata, hauili, minahassae, satterthwaitei, nota, ribes*), their trunks bristling with short branches bearing orange, purple or brown fruits about the size of cherries. Among the palms, *Arenga pinnata* and *Calamus maximus.* The latter is a climber with spines at the tips of its leaf, which curves out beyond the host as a long searching whip (The related *C. ornatus* has such a flagellum at the base of its leaf). Another climber, not unlike a palm in its life-form, is one of many species of *Freycinetia* (New Zealand and Hawaii each have but one species!). Several orchid and fern epiphytes. The most abundant of the latter is *Drynaria quercifolia,* with its curious dimorphic fronds: the compact, broad cup-like grayish ones surround the slender bases of the more delicate green expanded ones. A beautiful example of *Asplenium nidus* catches the light of the canopy in its translucent crown, high on the expanded branch of a *Ficus nervosa.*

In the larger openings, solid stands of *Trema orientalis* : like pin cherries in Pennsylvania or Quebec, very viable seeds distributed by birds, quick to fill a clearing. Also the ubiquitous *Leucaena glauca,* itself like a locust thicket. Rank graminoids: *Pennisetum macrostachyum, Setaria palmifolia, Paspalum conjugatum, Scleria scrobiculata.* The enormous zingiberaceous herb *Caulostraphis elegans* can reach a length of about 20 feet, although its huge stalks are usually arched down to about 6 feet. The neatly distichous, shiny leaves make it look like a huge frond.

Al and I leave the trail several times and explore the forest. There is not much more there, a few herbs (a *Begonia* , a *Habenaria*), a denser growth of saplings. The soil is black and slippery, but there is no open, aerated humus layer!

As it is not permissible to stray farther up, we do not see any undisturbed forest (such as was studied by Brown many years ago).

Return to the Agricultural Station. The whole Congress milling in and out of a large room where an excellent lunch is being served: hot bouillon, meat sandwiches, sweets and coffee. Our hosts, and particularly the members of the resident scientific staff, are attentive to our every need, and engage us in conversation with a grace which we now recognize as typically Filipino and which relieves our own awkwardness. Several of them have studied in the United States. All of them

Upper branches of an outstanding *Ficus*, heavy with epiphytes, mostly *Drynaria quercifolia*.

speak excellent English.

As there will be no more botanizing today, we join a "general" party which is bound for the South-Eastern College where we have been promised native dances.

We wind rather leisurely through the countryside. This is one of the best experiences so far. The bus stops when we want to take pictures. The patient men and their carabaos ploughing the flooded, sticky soil. The lovely girls walking on the highway, carrying food or leading children. The farmer feeding his cattle. Small boys, naked, climbing the glistening flanks of the half-submerged buffaloes, sliding off their hides or quickly plunging between their static horns into the opaque water. I can evoke no truer image of joy (A low standard of living? *What* do you mean?).

Through the rich rice plain. Thatched roofs, carabao shelters, brightly-coloured clothes on the lines, a banana plant, a papaya tree, fowl pecking, children playing - lots of children. A thin translucent macaroni, made from rice paste, is spread out on wire frames to dry in the sun.

Through the town of Santa Rosa. A nice Mediterranean bridge where we pause. The estuary is a rich gray. The fishing boats have small thatched cabins, pontoons, arachnean cranes to lower and hoist their delicate nets. Fishermen in canoes, or up to their necks in the water, on the edge of the sword-like rushes. In the background a low mangrove curtain.

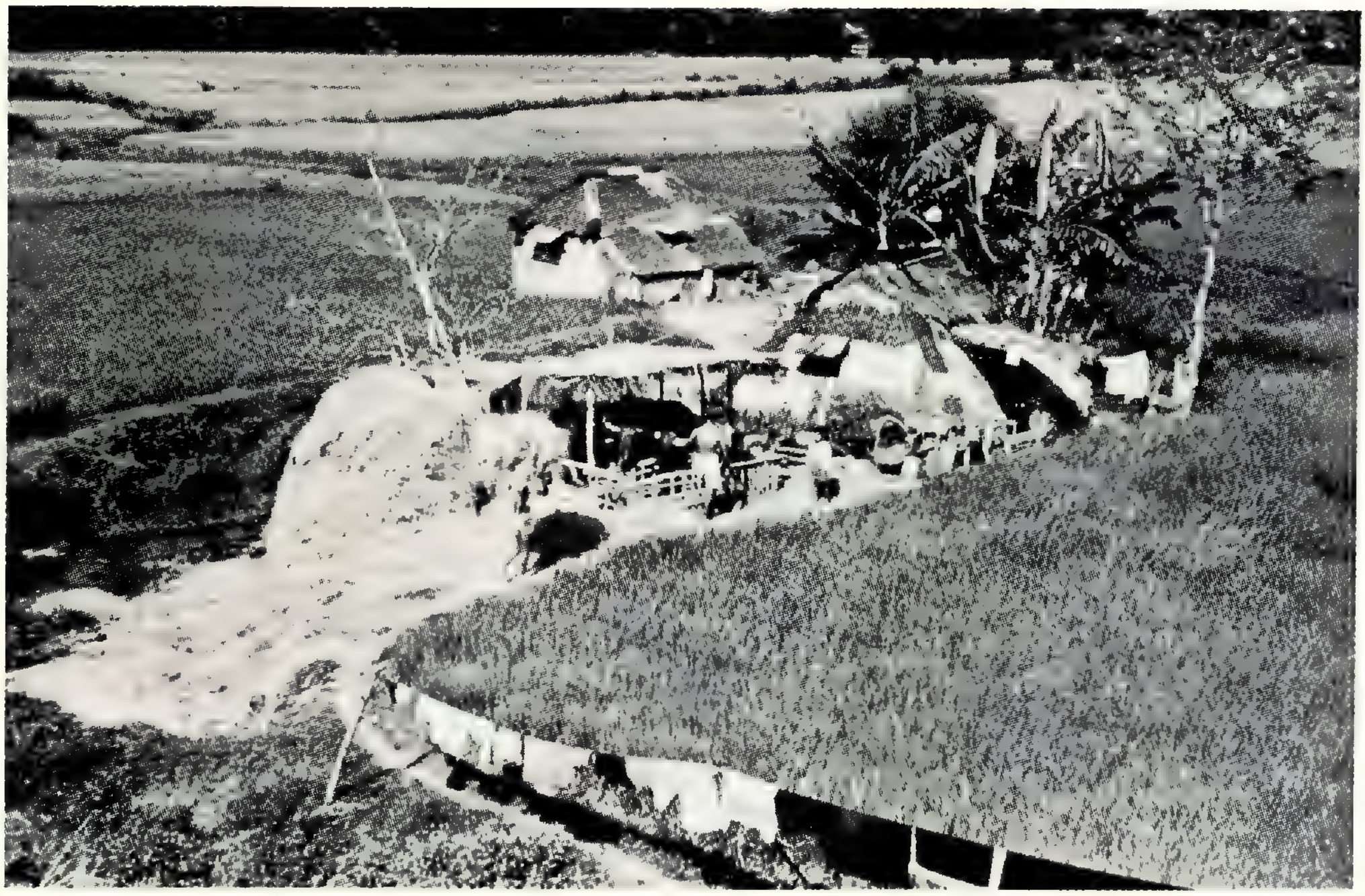
We visit an old church that has a bamboo organ, played by a young boy. A poor, bare, whitewashed church, an unsophisticated but unsentimental music. There was never gold nor marble here. All of the space is for prayer. The eye can feast only on the golden light that filters through the fig-trees in the yard and touches the rough pillars and the floor.

We drive away to the suburbs of Manila. Through devious streets to the yard of the South-Eastern College. One of many privately-owned schools, this one is run by Mrs. Canuto G. Manuel, wife of the head of the Zoology section at the Museum. We are received in their house, a beautifully panelled, airy residence. A delicious cocoanut punch is served. And we are so thirsty. It is well to beware, however!

The students (how old are they? they seem to be 12-15, must be 15-20?) put on two series of dances. The native Filipino numbers are by far the best. Many revolve around a story of courtship, or a comic incident of some kind. But some are more ritualistic and consist in stepping in and out from between two large bamboos that are rhythmically struck together by kneeling performers. This lends itself to many graceful variations of mood and tempo. Some of the dancers are exquisitely agile and seem to invent new steps. One boy is tremendously enthusiastic, very nimble, and quite a showman.

There follows a number of cow-boy and chorus girl tricks right out of Hollywood. Gone is the grace, the invention. And gone are we, for it is dusk and we must get on to the next event.

Roger Heim and I have dinner together at a small, intimate Chinese restaurant. It is good, it is restful to speak French. Heim and I speak the same language in more ways than one. "Nous qui savons toujours raison garder?" Reason carries something else besides its meaning in English. We discuss expeditions and their organization. He plans a rather ambitious undertaking to Africa for the staff of the Paris Museum. To Africa in a ship. Bring 'em back alive. Zoological garden, Botanical Garden personnel to go. Out of Bordeaux to Dakar, along the coast, and up the rivers. I express my admiration for the excellent work done in Tropical Africa by the French, for their



A small farm on the Plain (near Calamba). Rice fields in various stages of growth.

A Filipino farmer and his carabaos under their shelter; farmhouse and clump of banana plants in the rear, ricefield to the right.

capacity to work together and to maintain individual points of view and distinct interpretations. Heim takes issue with Mangenot's acceptance of the Montpellier methods and their application in wet tropical areas!

531127

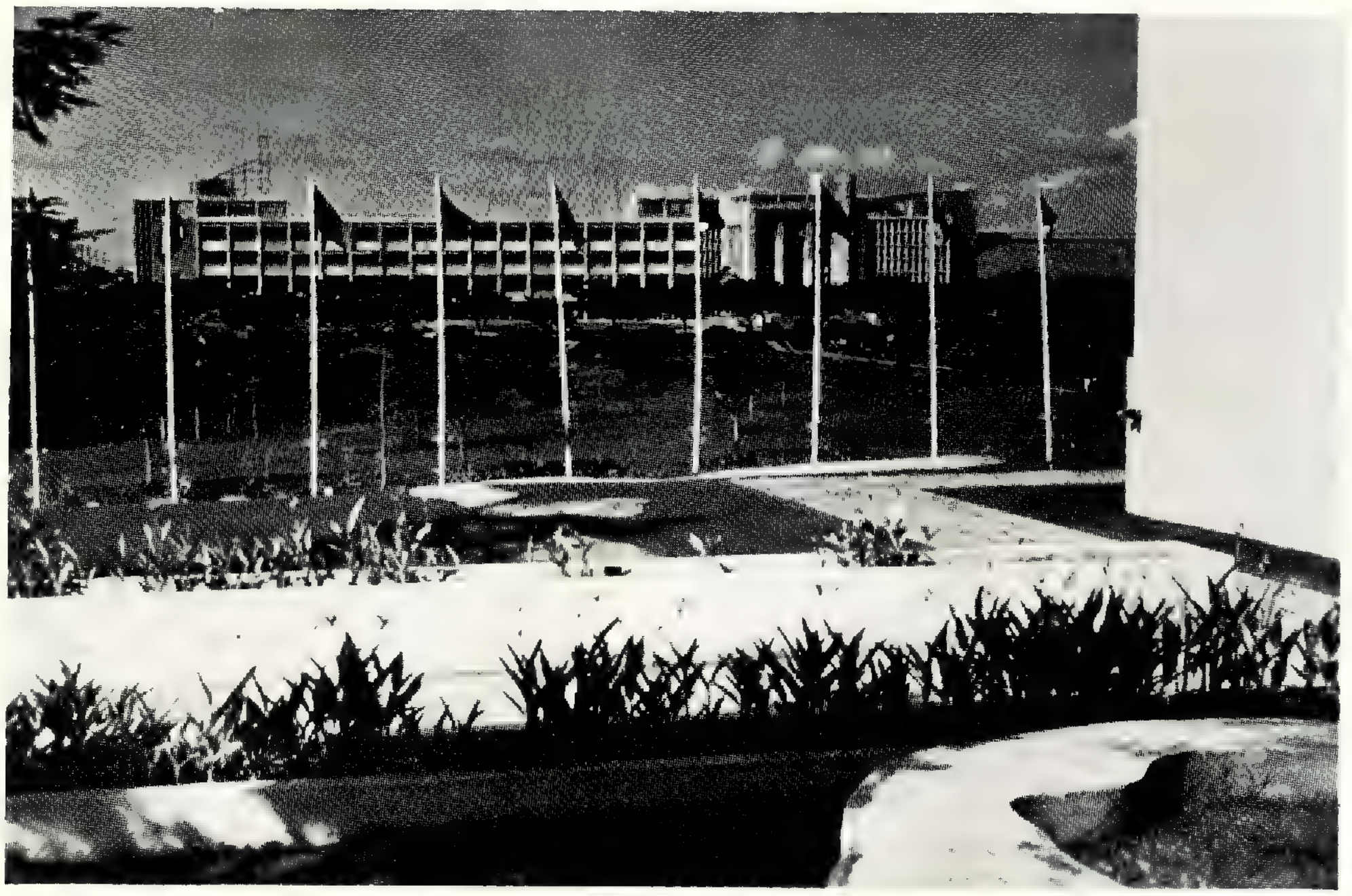
Oliver presides over Botany meeting today. I am very disappointed by the absence of Bharucha, who is on the programme with a paper on "Uniform nomenclature for the study of vegetation in the Tropics." Not even an abstract. India is hardly represented at all at the Congress. More is the pity, since so much excellent work has been done there.

I give a brief account (in English) of Léandri's paper on the Thymeleaceae in Eastern Indochina.

Mona Lisa Steiner. How optimistic her parents must have been! What a chance they took. But they were right: she does indeed look like Leonardo's enigmatic woman (Frangipani flowers in her dark hair are more reminiscent of Gauguin, however!). Has much to say about endemism in the Philippine flora, after a great deal of field work (under Quisumbing's general direction, but never with Quisumbing). Euphorbiaceae, Rubiaceae, Moraceae, Annonaceae, Lauraceae, Sapindaceae, Melastomaceae, all have high percentage of Philippine endemics. On the contrary: Thymeleaceae, Scrophulariaceae, Convolvulaceae have not! Generic endemism low: 36 out of 1350; specific endemism high: 5850 out of 8500! This is because the separation of the Philippines from neighbouring islands is comparatively recent.

Mrs. Steiner has done most of her work in the Orchidaceae (on which she has published a book). She is growing a number of them. An interesting case: *Dendrobium heterocarpum* occurs from the Manila Plain to the Highlands, where the plants are shorter and stouter. After three years growth in Manila, highland specimens retain their original characteristics.

By lunch time I am a bit heavy with the humid heat. Glad to sit with a party of Frenchmen. Less of an effort to talk. We are joined by the head of the Thailand delegation, Mr. Indrambarya, and by Julian Huxley. Interesting faces around the table. Monod, dark, lined, with intense brows, a small strong chin, lucid stare. Saurin, a smooth, taut skin, kindly but somehow disillusioned eyes. Serène, the image of Mephistopheles, with his long, drawn face, pointed whiskers, sparkling eyes, unless he is more like Don Quixote with high brow, windmill arms. Ranson, the French "jeune premier" nearing middle age, handsome features easily disfugured by a pout. Groslier, squarejawed, athletic,



The Administration Building of the University of the Philippines and part of the Campus seen through the patio of the Arts Building. The flags of all the nations are lined up in front of this building.

Three Filipino students, in one of the many beautifully landscaped courtyards of the University of the Philippines.

looking more soldierly than intellectual, ready to dissent and affirm. Moréchand: is he not "le grand Meaulnes" in person? Huxley: crisp, curly, thinning hair, sharp eyes, energetic face cast like an iron mask and yet sensitive, responsive; inquiring; demanding, yet generous; hands that move, that seem to control a silent play. An urge for directness.

I walk back to the main building with Huxley. He is scheduled to debate publicly on population with a Catholic priest. "Who will win?" I ask him. He shrugs his shoulders, as one who has been deadlocked before on this issue, says something about "this disgusting pullulation" and the "unrealistic" attitude of the Catholic Church. But we are now in a darkened room and a documentary is about to be shown. We do not have time to develop the argument: the politically illogical vs. the humanly unrealistic. The Church whose goal is in another world, the scientist whose kingdom is here and now.

Harold Coolidge introduces a film made in Indo-China in 1951-52 by the Coolidge Foundation Expedition. It concerns a rare bovine species, the kouprey, or Indo-Chinese forest-ox, and shows its habitat and habits as well as those of three other bovines. Film is in colour, photographed by Charles Wharton, head of the expedition. A great deal of the savana and woodland country is revealed in soft-focus impressionistic pictures. The animals are seen in herds roaming among the slender blue trunks of the trees, crushing the tender green crowns of the ferns and bending towards purple and yellow grass. First we see the banting (or red ox). White rump patch. Males turn black with age. Bull looks like Hereford, cow like Guernsey. Elds deer and Sambar does also roam this land. Myna birds perch on big mammals. Next comes the formidable (but widespread) water buffalo, with the Jivaru ibis (largest in the world), the scaly anteater (pangolin). More savana (perpetuated by burning) and the gaur (6'6" high at the hump!), very black, with its "roman nose." Grazes in abundant tall grass forming an even layer under scattered trees. Finally the curious kouprey (which Coolidge has described as a new genus: *Novibos*). Old males very dark, have a very prominent dewlap, shed their horns! This rare mammal is something more than a curiosity, may be related to an ancestor of *Bos indicus*.

At business meeting of Botany section, a number of excellent resolutions drafted. More realistic than those submitted at Christchurch. Not much use recommending projects on which no one is likely to work in the near future. I was myself guilty, in 1949, of pushing resolutions concerning phytosociological work and physiognomic classification of vegetation. Was subsequently offered trips to the Tuamotus and to Ifalik which I was not able to accept! The present resolutions

all concern research which is reasonably "in progress." Should be ratified by main body.

At 16:30, the Botany Department offers what it calls a "light merienda." This turns out to be a generous and exquisite display of Philippine delicacies. I rather wish my appetite were à la hauteur! Our hosts explain the composition and culinary techniques involved with much grace and patience. The hyaline macaroni, the rice wrapped in leaves, the sweet cakes are delicious.

An hour later, in our Sunday best, we are at the Malacañan Palace, where President Quirino greets us. The presidential residence is a vast, airy, mediterranean construction, luxurious, but not pretentious. The president looks very worn, in fact ill, but speaks at length. It is a warm evening. Much standing and stomping about and balancing of glasses, munching of crunchies. I exchange a few words with the Indian delegate, a very handsome man in white tunic and sash. By now many people have become well acquainted. There is a general feeling of purpose, of work done together (Zusammen-something-or-other that has bred Gemütlichkeit!).

Velasquez has invited us (St. John, Doty, Walker and me) to his home. Back to Campus and an attractive modern home. Painted cinder blocks; fine tropical wood paneling. The dinner offers a pleasant compromise between Spain, America and Malaya. A small, roasted bird, exquisitely seasoned vegetables. The company is charming, including a young girl, a cousin of Velasquez, who is studying at the University. Mrs. Velasquez also teaches at the University. Both were students in Ann Arbor (before my time), and seem to remember those days with much pleasure.

The ride home at the end of this most busy day is long. The bumpiness, the heat, the slow progress. But this weariness is different, a tropical oppression, a heavy-scented restless night.

531128

Final session. Attendence reduced. Resolutions cut down a good deal, as far as the Botany section is concerned. Fortunately, attention is drawn to the great "Flora Malesiana" enterprise and a plea is made for effective international support. Thailand invitation accepted. Next meeting, Bangkok, January 1959. Vietnamese delegate speaks flawless metropolitan French. Strong contrast of French colonization which operates from the top down, really assimilates an élite, with the American conquest of the Philippines!

And now, return to town. Delegates departing in various directions. Let-down feeling of parting and thought unexpressed. But also, something accomplished. A need for hours of solitude and reflexion.

At the "Taza de Oro," I run into Russell Fifield. I ask him about the elections, which he witnessed (a few days before our arrival). He shows me newspaper clippings which I do not like: the Church had stepped into the arena in favour of Magsaysay. Even bishops have been rather explicit in their advice on how to vote. Worst of all: "Vote for Catholic candidates."

We go off to the Jesuits' mother-house to find out more about this. We are very cordially received by a Filipino father, the superior of the Retreat House, who gives us a good-humoured account of the situation. The Jesuits play an important rôle in labour affairs, with their usual courage and facing up to controversial issues and their usual preoccupation with social order and orderliness. Here, as in Brazil, I have the impression of their being more liberal than the Dominicans (which will always seem odd to me!). The Retreat House is in a lovely setting, a garden by a river. But it has a garishly decorated concrete and papier-maché oratory dedicated to the great St. Francis Xavier, which defeats all the temptations of a vain aestheticism!

Fifield and I walk back part of the way, through the dusty streets, the breath of the open shops upon us, the pleasant stare of the people about us.

I am back in my room. The sky darkens in my broad window. The grass a deeper green in the square. The barringtonias static in the quiet twilight. And just beyond, the stream of jeepneys rushing down the boulevard. All these oriental faces, not mysterious. A joy that wells up into the eyes. Acceptance of fate, such as we know not? How kind they have been to us. Not as we are to them, not as we who live in plenty.

The congress has been a success. It marks an important date in meetings of this kind. The attitude of the organizers. Their knowledge of the cultural heritage (as well as of the national peculiarities) of their guests has really allowed common ground to be established from the beginning on something broader than exchange of scientific information. I am inclined to think that the Spanish influence has something to do with this. Dead as Iberian culture may be in the Philippines at this time, a peculiarly Latin feeling for intellectual exchange and for social grace still prevails (One very interesting point: the Hawaians call themselves: Tom Chang, Mary Nakamura,

Bob Escudero. The Filipinos have first-names in harmony with their family names: José Avellanos, María Santos; no Toms, Dicks and Harrys here!).

The Congress itself was very competently organized (Not the least stimulating part was the participation of the U. P. students!). One very useful item was the printing of a thick volume which contained substantial abstracts of the papers to be presented. Unfortunately many of these abstracts were actually read to the section members. The organizers had no control over this and could hardly have prevented it. But it seems to me that something could be done in the future to improve the procedure of national and international congresses. Here as elsewhere, we simply do not make adequate use of our modern gadgets!

What I have in mind is this. Each speaker should provide his audience with printed or multigraphed sheets which include the pertinent *factual data.* These should never be read or projected on the screen. The author should also transmit an outline of his argument and conclusions very much in the style of the present "abstracts." He could then stand on the platform to develop his argument or a part thereof, rather briefly, and then answer questions. In fact, he should himself launch the discussion. This would spare us long periods of listening to enumerations and descriptions that too frequently take up the entire time allotted to one speaker.

As I jot down these impressions--the outcome of much conversation with fellow-delegates--I think of so many ways in which we are falling short of our technological advantages and making inadequate use of our intellectual opportunities. How timid we are in breaking with tradition, how unimaginative in our innovations. We still let things happen, let institutions grow "naturally" (Who dreams of releasing the pressure at Ann Arbor and Lansing by founding "de toutes pièces" a full-fledged university at Marquette, opening next year to 5000 students? No precedent!).

531129. MANILA to BAGUIO

Un matin nous partons, le cerveau plein de flamme,
Le coeur gros de rancune et de désirs amers,
Et nous allons, suivant le rythme de la lame,
Berçant notre infini sur le fini des mers.
Les uns, joyeux de fuir une patrie infame;
D'autres l'horreur de leurs berceaux, et quelques uns . . .

Fishing boats with pontoons, small cabin and cranes. In middleground fishweir. In background, mangrove. Santa Rosa.

Just outside the town of Bontoc: modern, large houses, broad rice terraces at lowest level; narrow ones higher up, on left side. Background and right: deforested, eroded slopes.

It was dark when I entered the church this morning. No birds flitting about the altar this time. Mostly grave old women and happy young picnickers.

Having compressed our baggage to a minimum, we all chat optimistically on the hotel steps. Dr. Quisumbing, unfortunately cannot come, as one of his grandsons is dangerously ill. Dr. Santos will direct the field party, aided by Mr. Mendoza (of the Museum). Mrs. Mona Lisa Steiner is also here, and three charming girl students. The foreign members: Fosberg, Egbert Walker (U.S.A.), van Steenis (Netherlands), Heim (France), St. John (Hawaii), Oliver (New Zealand), Hoogland (Australia), Sutarman (Indonesia), Wyatt-Smith and his wife (Malaya).

Here comes the bus, with its cheerful driver. It is a boxlike affair, looks small for 18 people. Baggage and presses (empty now) are piled on turret-top, sheathed and strapped. As we sit down we are reminded that Filipinos are small, do not have long legs. Diagonals are adopted. Shifts. We rattle off on the cobblestones. For the first hour, the three girls (crowded into a seat for two) giggle at every bump.

Half-way up the Plain, at San Miguel, we stop in a dry, harvested rice field and identify a number of weeds. Clumps of umbrella-palm (*Corypha elata*) in the distance. Lustrous floating carpets of water-hyacinth in the ditches. Here and there, as though planted, the white flowering shrub *Tabernaemontana pandacaqui*.

Lunch at Tarlac. This is the real thing, a roadside, small-town restaurant. Oil cloth on tables. Big fan, crepe-paper streamers and flies. Excellent rice and fish, good, cold San Miguel (Pilsner) beer. Rumble of the street, calls of bus drivers, the lackadaisical otherwordly waitresses of the dull-black eyes. It is very warm (I do not have to remind myself of the Ann Arbor December climate. I *really* like this. If I lived awhile in this unremarkable town, would I not wander down the street looking for all the world like that happy middle-aged man with the mustache? Would I not be speaking Tagalog and have known this steaming plain all my life? Who, in the name of Mitty, ...).

Across the river on a handsome new bridge. More miles of flat rice country, of deep gray muddy fields and muddy carabaos, graceful palms and cheerful faces. Across an ultimate river and upgrade. No more rice. The narrow Kennon valley. We stop at a place where the road is cut in the side of a cliff. The seeping walls covered with mosses and algae. Long streaks, now dried, with hanging strands of dead bamboo (*Schizostachyum brachycladum*). Narrow ledges, mere

notches on the face of the rock, harbour dense clusters of the beautiful dimorphic fern *Drynaria quercifolia*: its clasping lower leaves sheathing its base in a dull-gold shell, its radiant upper leaves like green plumes emerging.

There has been no particular planning of stops. Our guide, Santos, Mynheer van Steenis and Fosberg, between them can name most of the plants. Santos knows the grasses very well. I follow in their traces and get the interesting ones identified, write down names, stuff away specimens in my press.

We reach the Pines Hotel before dark and have time to press a few plants before dinner. Roger Heim and I share a room quite similar to the one I had before. Again it is somewhat cool up here, but I am equipped with more clothes this time.

After dinner, pressing questioning, quizzing, exclamations, noting, revision of notes. L'esprit de l'escalier: "Now, why did I not record this and that? How moist was the soil? I should have collected a better specimen. . ."

531130. BAGUIO to BONTOC

Overcast day. The yellow grass of the pine savanna against the pearl-gray sky. But no sky when our bus plunges into the winding ravines headlong. Our driver is one of the best I have ever known anywhere. These murderous roads are reminiscent of many a vicarious adventure in XVIIth Century Spain and France (the romances of Dumas, Féval or even Mérimée). We rattle like peas in a pod in this square rigging as our chins meet our knees in a friendly tussle. But we rattle happily, because this is new, this is the first time, the first look, an initiation.

As we climb a particularly steep grade on a twining road, a great valley opens below us. It reaches out between the folds of many hills, exploring unseen regions beyond. The rice flats way down there are a tender green. Like termite mounds several rows of palm-thatched huts hug the edge of a gentler slope. But up at our level, open pine savannas, in various stages of regeneration. The big, scattered trees have black scars on their bark. The coarse grass and the bracken form a rank growth over the bare, rolling pebbles, the sticky pink mud.

The pines are truly in love with the wind. They bathe so freshly in this drifting air, they gently nod their inaudibly clanging stiff needles. Their branches flow not with the present wind, but are fixed in their flag-like motion by years and years of the ascending breath of valleys

down below. The green hair of the grass also curls and waves. But tomorrow it will be aflame and the naked earth will be beaten and channelled by the rains.

We stop many times. When the spirit (and usually also van Steenis) moves. There are many discoveries to be made. Almost all of us come here for the first time (Walker was through this country before, many years ago). Few plants v. Steenis does not know. Few species do I know. The lovely *Dianella javanica*. How impressed I had been with the delicate blue fruits and the luscious leaves of this liliaceous genus, first in New Zealand, then in Hawaii. The same suggestion of wetness and equability in the lovely *Blechnum* (cloud-forest in Brazil, beech forest in New Zealand, coastal hemlock forest in British Columbia!).

But here are some old friends: *Rhododendron, Gaultheria, Stereocaulon, Lycopodium complanatum* and *Lycopodium clavatum*. This clubmoss runs up and down the moist, recently cut roadside trench, rooting at the nodes, catching beads of dew in its silky leaf tips. I gather quite a bit of it for my friend, Léo Marion, who may find a new alkaloid in it! On these same road cuts a luscious *Gunnera* now past fruiting and two species of *Nepenthes*. I had always thought of these tropical pitchers as suspended on the branches of shrubs and trees around which their stems twined. But here they are nodding among the coarse grasses, precariously rooted in the plastic mud of the escarpment!

We stop for lunch at the bend of a road. It is raining. We take refuge on a veranda, amid anxious dogs and inquisitive children. We munch absent-mindedly on sandwiches as we look out on the misty hills where so many unknown plants grow. Many wander off, so that we spend more time than we should in a relatively unrewarding search. Each time we clamber back into the bus it is more of a hardship. Passageway more and more cluttered with presses, oversize specimens, displaced baggage. We all seem now to have too many legs, arms, too broad shoulders and buttocks. Heim and I have exhausted our store of variegated French adjectives to express our feeling of discomfort and must resort to less pungent English (Unless it can be said in Tagalog?).

It is already afternoon and we have more than 100 kilometres to go over this winding, rocky, sticky road! Frequently we must stop to let a car go by from the opposite direction. Thus we encounter many large buses. These vehicles are truly extraordinary, being wide enough to accomodate 6 or 7 people in a row. One or two even sit to the left of the driver. It is cool, on this wet day, but some of these

Village high up on the mountainside. Very narrow rice terraces, small, conical huts.

Narrow highland terraces. A good deal of *Miscanthus floridulus* on the dry ground.

people wear very few clothes. Strangely enough, many of them have knotted a kerchief over their faces to keep their noses clean of dust, which is supposed to carry "germs." This gives them the air of benign highway robbers. But the unsheathed faces all look at us with a friendly stare. Frequently people wave and cheer us as we go by.

More eroded hills, small flooded terraces, winding road, the gravel churning under our wheels. Pines on the slopes, evergreens in the ravines. Hours of this, and then suddenly the first podocarp! I sit up in my seat and peer out of the window, as excited as the day I left Ann Arbor. I have dreamed of podocarps, to me the symbol of the cloud-forest! Here it is: *Podocarpus imbricata,* a good-sized tree, with very small leaves quite similar to the New Zealand *Podocarpus dacrydioides.* It is so late that we cannot stop, for soon we shall be overtaken by the darkness (And to think we spent so much time on those roadside weeds!). The podocarps grow in a mixture with many broadleaf-evergreen trees (*Saurauia elegans*, *Helicia, Clethra, Eugenia, Medinilla, Litsea, Aralia, Evodia*). The pines remain on the fringe. We see a few, rather small individuals of what looks like the beautiful *Podocarpus neriifolia* ! Also *Phyllocladus hypophyllus* ? Epiphytic growth very rich. Lots of ferns everywhere. A few stands, just by the road, of reasonably intact forest, reminiscent of Campos do Jordão (Brazil) at the cloudforest level.

But now, about 65 km. S. of Bontoc, we come to another pine area and it is a long while (some 13 km.) before we see another podocarp. The pines occur in denser stands--in true forest. Also the has become conspicuous, hanging from the branches in long silver-green strands. Pine reproduces sparingly, except in clearings. Very few broadleaf evergreens, but lots of tree ferns, especially in ravines.

Just before dark (52 km. S. of Bontoc), a few more podocarps, an evergreen oak! And now the night, as I sink back on my bench exhausted by the tension. Our headlights pick up the occasional clump of yellow Mexican sunflowers. It is raining again. We are tired and not a little hungry.

Pitch dark when we clatter into Bontoc and sidle up to the inn, a rustic, open place. All woodwork. A cordial innkeeper, almost in the Swiss tradition although he is a Syrian. He cannot lodge all of us. So we go off to the Hotel Baylis. A truly wonderful country inn where things used to happen when we were very young and read Paul-Louis Courier, or Daphne Du Maurier: kindly Corsican assassins and rebel refugees quietly looking up as you entered. A large airy common room, completely open on one side. A lateral outdoor stairway. A gloomy corridor with cubicles on either side. Electric bulbs dangling,

solitary. A hard, broad bed with a mosquito net. Very poor, very clean. The essence of good hospitality. Home for the traveller. A shower. Uncertain shaving in the dark. Back to the Bontoc Hotel for dinner: good rice, chicken, San Miguel beer, at a very long table. Other parties (Anthropology, Public Health) have preceded us. We do not make merry for long, as we are exhausted.

But I cannot sleep yet. The wet air seeps in at my window. I can feel this unseen village breathing softly in the night. All these other houses beyond our house shelter many dreams that seem to drift out to me. But my longing is for the podocarps in the mountains above, drenched in the sweet tropic rain, spread over the glorious crowns of fern, sheathed in the green fur of mosses.

531201. BONTOC to MOUNT POLIS.

Wet pavement in the early morning light. Something more than mist ("Quand le ciel bas et lourd pèse comme un couvercle . . . ."). Main street well paved, clean, lined with shops. Men in G-strings and T-shirts. G-T is all the rage, and is topped off with aluminum helmets. Old bontoc culture quietly going to pieces. The women wear full garments, mostly a lovely striped cloth which they weave themselves. Market place very quiet: fish and fruit, squirming children and patient old women. The men squat in the doorway of the many open-front shops. Familiar country store (The same faces, really, as at St. Antoine in the Richelieu Valley when I was a boy).

It takes awhile after breakfast to round up all of our people. Suterman seems to be lost. We go the full round of the village in search of him. Several large streets, the marketplace, nice modern schools and post-office. And small alleys that lose themselves among the thatched huts. Palms, bananas, papayas, patches of vegetables. Girls are frightened of being photographed, run away.

Out of town, over the broad river, now at a low ebb. Rocky flats, very silty water. Long broad terraces in lowland. People at work, mostly women. Few cattle. We follow the river bottom quite awhile. As we rise along the hillside, terraces more congested, narrower. Rice and sweet potato alternate. The latter cultivated in small mounds, the mounds arranged in rows, crescents, circles, and even spirals: green motifs on the dark red earth.

The highest point between Bontoc and Banaue is a windy gap up on the shoulder of Mt. Polis. There we stop. As we get out of the bus, the rain takes possession of us. Whipping, ripping, drenching. It is hard to write down notes. By the roadside an enormous *Anemone*

vitifolia (Himalayan plant on its southern edge). Wrapped in our raincoats, hugging our presses, we walk up and down the road. The forest here looks interesting. Gone are the pines and open slopes. This is thickly clothed with evergreens.

Our guide shows up, a young Igorote, his bare thighs and buttocks dry in spite of the downpour. He climbs upslope ahead of us, showing the way, cutting down lianas and young tree ferns that stand in the way. One of these has a very spiny trunk. Our guide knows: there are no spines in his flesh.

Stop! Think! This is it. This is what you have been dreaming of. Moss forest. Every trunk and branch thickened by a green sheath. Orchids and gesneriads on the boughs. The trees with medium-sized dark-green leaves. The peppery taste of one reveals *Drimys piperita* (or *Illicium* ?). There are several rough, entire-leaved oaks, very twiggy; *Saurauia* with its golden pubescence; also *Medinilla, Platea, Homalanthus, Polyosma* and even *Ilex* and *Vaccinium* with fine lustrous leaves. Van Steenis grasps a twig from an overhanging tree and thrusts it at me: "What is this?"

Apparently I should know: opposite, entire leaves, medium-sized, hard texture. It is *Acer niveum* ! What stories have I not told my students about this precious Indonesian highland evergreen maple? And here it rests in my hand, inoffensive enough, and yet it holds the clue to the origin of the deciduous forest? Here I am surrounded by oaks, maples, hollies, blueberries! But they are somehow less evident than the exquisite *Cyathea* tree ferns, the flaming red gesneriads, the delicate filmy ferns, the climbing *Freycinetia* with its tufts of sharp leaves, the precisely channelled blades of melastomes, the numerous unknown herbs on the forest floor. Above all, these maples, oaks, hollies, and blueberries do not look like maples, oaks, hollies, and blueberries! It is a long way from here to Michigan or Quebec. The detour is through China and Japan or maybe back down Indonesia-New Zealand way, and up along the Chilean coast and at mid-altitudes in the Andes to Mexico? After all, the podocarps are just a few miles away and they run north and south. China ("cross the bay") has a wealth of maples and oaks. In Japan and Kamtchatka they mix with northern Gymnosperms. . .

The rain has not stopped, but in this dense forest we are fairly sheltered. Our guide literally slides between the raindrops, his thighs and hands dry, whereas every exposed surface of our skins glistens with sweat and rain. The soil is very slippery on the slope where the trees tend to buttress and stilt. Lianas are not very numerous, nowhere really form a tangle. At the top of the slope, the canopy is more open and the undergrowth denser. The middle third of the trees is

especially thick with moss and fern epiphytes (the famous "moss line" of Richards). How I wish Hosokawa were here; he knows a great deal about this kind of forest!

As we sidle down through the moss forest, grappling at the lianas, the spiny tree fern, the smooth trunks, the deceptive moss sheaths, losing our foothold frequently, we grab twigs and branches, flowers and fruit. I attempt to write on the soggy pages of my notebook whose red cover stains the paper and my hands.

Back to the village. Downhill. Downpour. Workers in the flooded fields. The red *Cordyline* on the terrace edge, a whole row of them where labourers were killed in war.

Several hours drying, pressing, re-writing notes at our hotel. A hot cup of tea very welcome. This strange mountain inn would become home in no time! The family takes a discreet interest in our botanical operations. I daresay the careful preservation of so many branches and grasses seems less strange to the children than to the adults!

At dusk I wander up to the ruins of the church. Bombed out. Temporary church roughly constructed ("C'était une humble église au cintre surbaissé"). I stop in at the rectory and meet a very pleasant young Belgian priest (who unfortunately speaks no French). He tells me of the strong tribal habits that persist here. People of one village mistrust "strangers" from nearby areas. For instance, a few weeks ago, a peasant 10 miles from here had a serious accident. A force of twenty men escorted him to Bontoc hospital, for safety's sake.

The young priest walks down to the inn with me, seems happy to talk to an outsider. He has the clear speech, the calm look, the joyous gait of some of my Jesuit friends.

At Bontoc Hotel, George Clarke has arrived, after a miserable trip. A landslide held them up for many hours. Their driver has remained there, up in the mountains, on the other side of the gap in the road. They got a rugged ride down to Bontoc, are dead tired. But do honour to an excellent meal.

Evening of dances. A few women participating, but the active part is played by the men. Music by clanging metal drums. Monotonous tong'ga-tong'ga-tong'ga! Varies in rhythm and tempo. Principally a circular, crouching-surging movement. Some war-like skirmishes. Nothing erotic. Some of the older men wear only the traditional G-string, usually of bright red cloth. The younger men pride themselves on T-shirts and helmets. The esthetic effect is dubious. At the centre

a large truck tire ("lassé d'un long voyage") is set aflame. Sandalwood, flowers in the hair of dusky beauties, palm mats to sit upon are a thing of the past.

These people are not good-looking. At least, they appear quite healthy. Short, compact, very strong bodies, broad, intelligent and friendly faces. Some of the young men talk to us in halting but tolerably good English. They complain that roads are not being well kept, that local labor is not made use of (Am I back in St. Antoine-sur-le-Richelieu? or in Podunk, Michigan?).

531202. BONTOC to BAGUIO.

The road is still "out." So we may have to spend the day in Bontoc. A pleasant persprective. I pay another visit to the Belgian fathers who are having breakfast with three other priests from neighbouring settlements. I get some interesting information from them. I am curious about their approach to the native culture on which their confrère, Father Vanoverbergh, is a leading authority. They do not make a fuss about clothing, for instance. No mission dresses here. It is heartening to know missionaries who do not rely on western culture as the necessary vehicle for the Christian faith.

Father Baute, whom I had met yesterday, has to teach a class and leaves us. Father Nollet conducts me on a tour of the classrooms. I enjoy myself thoroughly by making little speeches to the children, to whom I bring the greetings of American children and schoolmasters. They all rise politely when I enter and walk down the aisle. They smile and titter. I say who I am and what my purpose is, and how beautiful are tree ferns and how lucky they are to live surrounded by them (This is ridiculous of course, but aren't all foreigners eccentric anyway?). To the biology class: look hard, look at the ferns, not at the textbook!

These children appear healthy. But it seems that 7 out of 10 die before they are 3 years old. This the official statistics do not show. The priest tells me of one occasion when he was called to a distant settlement during an epidemic. He baptized 47 sick children. Came home and alerted the health service. A nurse went out the following day, could get no one to acknowledge illness and be treated. Widespread, almost systematic suspicion of "officials" (If the pattern is anything like that of the Amazon, where even Red Cross and UNICEF relief were bartered or sold, they have good reason!).

The Sanitary Service officer in this village is a very fine man who gives me an outline of the local situation. I am surprised to hear that

tuberculosis is no problem here (it is in the Lowlands); but broncho-pneumonia and other pulmonary diseases take a heavy toll. Malaria is endemic in two-thirds of the Mountain Province.

It is a pity that we missed the fiesta, which occurred a few weeks ago and is held every 5-7 years. Involves a great deal of "conspicuous spending." For instance carabaos are slaughtered, their heads strung up in front of their owner's house.

A visit to the road engineer. Bustling office with lots of clerks, piles of paper. The engineer a very urbane fellow. He says it costs 850 pesos per kilometer per year to keep the roads passable. It seems that we may now go, as the landslide has been mended.

We retrace our steps towards Pingat (which we had not seen on the way in, for it was then dark). Beautiful clumps of the ubiquitous *Melastoma malabathricum*, its large deep-rose blossoms fully opened in the morning sun. The weedy Mexican sunflower nods brightly all over the landscape. On the road-cuts, clumps of *Rhododendron.* A dusty *Artemisia* (*capillaris ? japonica?*) by the roadside.

From Pingat to Clark Village, much pine, a good deal of it forest or at least woodland rather than savanna. We stop and survey one plot at an altitude of about 6000 feet. Slope to the East approximately 30°, trees 30-45 cm in diameter and 65-75 feet high, canopy cover about 50%. A second layer (also of *Pinus insularis*) 15 cm. in diameter, 30 feet high with very little coverage. Grasses (*Miscanthus floridulus*) and young pines up to 2 meters cover 20%. Lower grasses (*Imperata*), shrubs, very few pines and some herbs (*Cirsium luzoniense, Dianella javanica, Elephantopus mollis*, and the tremendously aggressive *Eupatorium adenophorum*) below 2 meters are quite dense, 60% cover. A good deal of humus in soil despite runways made by man, and fires. *Saurauia* is the most frequent broadleaf-evergreen invader under pines in this region.

A few miles before Clark Village, the first *Podocarpus imbricata* is seen. Here is a zone of rather intensive, and as it seems successful agriculture. It is a sort of high plateau, gently rolling. Soil dark red, almost black. Acres of sweet potato. Also lots of recently burned trees. Looks like the final scene of the first part of "Gone with the Wind." Infernal devastation. Wounds of fire and water. Gouging of the machine. The painful scorching of the soil by man.

At km. 52 (52 km. N. of Trinidad), another stop, the last. I am in a state of desperate excitement at the idea that I shall not, on this trip, really see, touch, feel, and penetrate into podocarp forest. Here

Near Clark Village. Gentle slope where sweet potato is grown. In foreground eroding bank with solitary relict *Podocarpus imbricata.*

A stand of *Podocarpus*, *Polyosma*, *Elaeocarpus*, *Litsea*, *Saurauia*, about 52 km. N of Trinidad.

it is, here are we, on the road, on the lip of a deep ravine full of evergreen trees dripping with epiphytes. A lovely temperate rainforest of podocarps and evergreen broadleaf trees (*Quercus*, *Polyosma*, *Elaeocarpus*, *Litsea*). Most of them openly and freely but irregularly and asymmetrically branched in the upper third, extending out to terminal leafy tufts. Upper trunk and branches clothed in a thin sheath of moss (not as thick as on Mt. Polis) and bristly with epiphytes. The orchid *Dendrochilum* nestles in the asperities and forks, its long grasslike leaves spilling gracefully downward. Big blotches of *Peltigera* cling to the very surface of bark or moss. A *Schefflera* is almost the only liana. I can do little more than snatch branches or tufts of all these. The *Podocarpus neriifolia*'s fruit, its bulbous red terminal part as amazing as the great width of its leaves (I already knew the vegetative parts from our Michigan Botanical Garden plants).

Again it is dark and the day is spent. And we can only sit and talk about plants. Heim is fairly well pleased with his collections: he has gathered a reasonable number of Fungi, some of which are probably new. He tells me of some of the controversies that are going on in France concerning the rainforest and the vegetation of West Tropical Africa. I am most anxious to meet the men who have done field work there, at the forthcoming International Botanical Congress, of which Heim is to be president. The programme is most promising.

Back to the now almost familiar Baguio. It is nice to dry oneself, wash, warm up. A pleasant dinner with the charming Mona Lisa, Heim, Fosberg, van Steenis and Walker. And then more pressing of plants, revision of notes. A final nightcap alone with van Steenis. He tells me of monsoon forests of Java with *Schleichera oleosa, Acacia tomentosa, Tectona grandis* (I had not thought that teak was indigenous there). It seems that there are quite a few evergreens in the upper canopy of this forest. Natives used to burn the vegetation deliberately. This would cause sprouting of herbs and attract deer. I wish there were more time to "exploit" him: he has a tremendous store of knowledge.

I must go to bed with an aching heart, a longing for the podocarps my hands have reached out for. I will dream that I wander all alone, at leisure, in their misty shade and that I have found an answer to many troublesome questions.

531203. BAGUIO - MOUNT SANTO-TOMAS - BAGUIO - MANILA.

We never seem really to get off to an early start. We ramble a good deal before hitting the road to Mt. Santo-Tomas, northwest of

town. To the foot of the mountain, mixed agricultural small plots. A winding road much like the road to Bontoc. But today is dry and the pink peppery dust rises around us. Poorly vegetated hillsides. Hard grasses on slopes, and patches of evergreen hardwoods in ravines. *Saurauia* most prominent. Grade gets steeper, road twists more acutely. A few men working, digging, filling up erosional breaches. We plan to drive the bus (our battered bus, now without a door-handle, its windows vibrating, encumbered with full presses, loose specimens, shoes, jackets, boxes, trinkets) to within 2 km. of the top. This should be interesting.

But it shall not be. The driver stops. Peering over his shoulder, we sight a gaping precipice 1000 feet below us. The road is no more: the cornice that bore it has been scraped clean of the hillside; the waterlogged clay has made a grand slide downwards. Nothing to do but walk. As it is late and we must travel to Manila tonight, Dr. Santos rules that we shall spend an hour hereabouts. So we scatter in various directions.

The landscape is most unpromising. Nothing in sight looks anywhere near "virgin" vegetation. Hoogland and I climb to the top of a rise and survey the land. We cross a small garden on a plateau, where strawberries, peas, potatoes and onions are being grown. On a very steep hill, among charred trunks, the untidy vines of sweet potato. A scrub of *Saurauia,* shabby tree ferns, the coarse, tangled grasses (*Miscanthus floridulus* mostly).

Erosion and more erosion. Deep gashes on the road banks. Some *Lycopodium* trailing on the wetter exposures. Many weeds and weedy-looking Composites (Among them, the blue Centaurea-like plant I had seen in Trinidad, which turns out to be the endemic *Centratherum fruticosum*). Hoogland and I start marching downhill, thinking that the bus will overtake us presently, as the hour is up and there is not time to explore further. We collect a lovely *Begonia* nestling on top of a shaded boulder (reminds me of *Begonia itatiaiensis* on Brazil's most famous mountain!). We walk and walk. Golden arrows of the noonday sun. Puffs of dust from the rolling stones under our now dragging feet. Shirts off. More sun, and a pleasant torpor that numbs all frustration. We reach the plain long before the bus comes rattling toward us.

Almost everyone takes group pictures before we part. On a street corner in Baguio. Self-conscious faces against a bituminous background. Actually, this farewell tardy meal in a Chinese restaurant is excellent and most cordial. It has been a too short but exciting trip. Heim remains in Baguio. Standing on the street corner, waving

goodbye, looks a bit like Tartarin de Tarascon.

Down the Kennon River Gorge once more. The reddish trunks of the deciduous trees in the lower area now almost look familiar. And the beautiful, steaming, fertile plain: this wealth of sugarcane and deep rich earth after the crumbling gravel and sticky red mud of the mountains.

Manila Hotel, all agog yesterday to pay homage to vice-president Nixon, now has spread all banners in favour of a visiting pugilist.

531204. MANILA.

We leave tomorrow afternoon. I am happy that there will be a little time for the idle wandering which I so enjoy in a strange town. I have taken in so little, as yet, of the atmosphere, the mood, the temper of the Filipinos.

Allan and I go to the Philippine Education centre. Very interesting Philippiniana. We buy a few books and pamphlets. I am deeply frustrated by my lack, at this time, of any immediate insight into Filipino culture. I have not met a single writer, poet, sociologist (as I had, and of such excellent quality, in New Zealand!). But here comes an archaeologist, who is also a man of letters, to whom Allan introduces me: Dr. Arsenio Manuel. He and his wife promise to come and have a cocktail with me this afternoon. The "objets d'art" here are of better quality than most I have seen so far, although the nut-cracker female is still with us. I buy a pair of unserviceable but exquisitely carved salad forks.

Groslier and Moréchand are also in the shop. The latter wanders out with Allan and me and we casually stroll through the market, the busy street, somewhat nostalgically rubbing elbows with this pleasant-tempered crowd. Tomorrow we shall go. All those faces will forever become dim, not each one recognizable and individual and alive as it is now. We must give our message today. I would gladly shake a hand or tap a shoulder, but who would understand?

An excellent lunch at a Chinese restaurant with Allan and Moréchand, with whom I wander back to the Manila Hotel. He plans to return to France next year, gives me his address. Does not seem to have much to say about life in Indo-China, except that war has not actually put a stop to scientific investigations. He is a very soft-spoken and discreet person. Moréchand is an archaeologist, has not yet completed his thesis, on which he has been working for several years. He tries to explain to us that this is not like an American

Ph.D. thesis. It apparently involves a great deal beyond meeting "requirements."

At five, Dr. Manuel and his wife show up and we go to the bar. They are small, sensitive, earnest people, who speak their minds in a flawless but pleasantly accented English. All they take is fruit juice, but the conversation has plenty of sparkle. Their approach to the cultural situation and its future development in the Philippines is a very detached, and, as it seems to me, mild one. Again I miss the resentment against the U. S. which I believe should exist. I cannot understand its apparent absence in the face of American power (although this is not accompanied by obvious arrogance). The Philippines *are* an American colony, economically. The autonomy of their political decisions itself can be questioned. If a high degree of economic dependance, the successful implantation of a foreign language, the infiltration of a way of life, do not spell conquest and submission, I fail to see what they do mean! I do not disguise my bewilderment in the face of this cultural growth: the functions of the family still involve communication in Tagalog; the intercourses of public life are carried on in English. Manuel points out some genuine achievements by Filipinos in English, names the following writers: José García Villa, Manuel Arguilla, N. V. M. González, Joaquin, Francisco Avellana, Pedroche, Daguio, Maximo Ramos. He inclines to think of this, it seems to me, as another stage, to be succeeded by an authentic Malayan-language culture.

This thought is somewhat discouraging to me: after the Spanish dead-end, an American dead-end followed by a Tagalog renaissance. Combien de recommencements? It is appalling. Yet logical, and in a way the most satisfying condition. But how many sacrificed generations must labour in the uneasy strait-jacket of a borrowed medium, an ill-fitting, uncongenial culture? It seems to me that the measure of this lack of fitness is revealed by the fact that *no* Filipinos speak English entirely without an accent, even those whose command of the vocabulary and grammar are impeccable. Must we think, then, that they are imperfectly assimilated (the Indo-Chinese speak French without the remotest trace of an accent!) and are even now forging a new idiom, more different from American speech than the latter is from the British? In fact, not many Filipinos speak in a peculiarly American way. They do not appear to be fond of slang (which they italicize or put in quotes) and their tone, rhythm and vocabulary generally has no provincialism but their own.

Allan and I spend the evening studying another cultural manifestation: jai-alai, the Basque handball game. A whole building devoted to it. Players, a closed corporation of pure-blooded Basques.

Exciting to watch. The long sweep of the arm prolonged by its "basket." Agility of the players, of which very few are really young, mostly in their late thirties, some in the forties. Most spectators more excited by the betting than by the play. Score is relayed to downstairs restaurant on a lighted screen. Some enthusiasts never see the game, bet according to a "system" in the best Monte-Carlo tradition.

531205. MANILA

Last hours in the capital. Pouring rain on the mirroring sidewalks. Fruitful visit to the Forest Service with Mona Lisa and Ray Fosberg. I get wood samples, a large coloured map of forest regions. Mr. Tamesis, the retiring chief, a capable and cordial man.

531206. GUAM

We do not see much that could pass for virgin vegetation. A great deal of cut-over land, waste places invaded by *Ipomoea indica, Pipturus argenteus*. An interesting tall scrub-growth on sharp scoriac lava, with *Carica papaya, Flagellaria indica, Triplasia trifolia, Leucaena glauca*; large patches of *Oplismenus hirtellus* on soil; *Ipomoea indica* tangling.

A more advanced stage (or a remnant of the original vegetation?) is seen farther inland where we stop to look in briefly. *Pandanus tectorum* and *Pandanus dubius* extend here and there above a slightly lower canopy of broadleaved evergreens which (Fosberg says) probably do not shade them out. These are *Pisonia grandis* (the climax tree of many coral islands?), *Ochrosia oppositifolia* (the climax dominant of some of the wetter coral islands?). Also present, *Muntingia cauliflora*, the rare *Guamia*, and *Cestrum diurnum*. The most conspicuous understory: *Cycas circinalis*.

Ray points to the interesting situation in the breadfruits (*Artocarpus*): two species and many curious intermediates. Introgression?

We must take leave of Ray Fosberg who is remaining on Guam for a couple of months.

531207. HONOLULU

How tedious our arrival. I almost spent the night in jail. Did not have a re-entry visa! Was liberated temporarily when a young air-force officer vouched for me. This morning, long parley with immigration "judge," who finally gives me the official stamp.

After tour of Bishop Museum, lunch with Alex Spoehr and Ernestine Aker at "Fisherman's Wharf" (Not to be compared with San Francisco, but quite good).

Short visit to Hawaii Sugarcane Planters Association. Renner Kahle laboratory and library, working facilities. Pemberton shows us impressive insect collection.

531208. HONOLULU - PALO ALTO

This lapse tiring. A plush airplane with reclining seats. I cannot sleep. The night will never end. Sordid dreams, all poetry spent. Karl Meyer very kindly offers McMullen and me a ride to San Francisco. I telephone Bill Steere in Palo Alto.

It is a joy to see the Californian landscape again, although this part is the least picturesque. The long undulations of the foothills around Vallejo. The industries, the Bay. But now, San Francisco, the most beautiful city in North America. Up the curving white-lined streets. Stucco, tiles, neat shrubbery of Junipero Serra Boulevard. Now out beyond to San Mateo, Palo Alto. Is this a dream? The flowing yellow grass and the solid black shapes of oaks spread across the hills. The hills that rise to the darker and greener coastal range. The known sea beyond with its probable bank of fog. Was I very young when I was here before?

Here we are, unshaven, haggard, tired, hungry. I must look like a soiled Greco ghost to Bill. We go to his home, a lovely house. A strange mauve-fruited *Eugenia* in the garden. Fortunately Dorothy is not there to see me looking so ragged. Bill gives me a cup of tea, then he goes back to the University. I take a shower and sleep.

531209. PALO ALTO

This morning, in Palo Alto, rose late, breakfasted alone, took a deep breath of the sweet December California air, nodded to the oaks, the eucalypti, the casuarinas, all good friends of happy days. Went over to the Carnegie, had quite a gay and cordial chat with Bill Hiesey and Paul Grün (he is leaving for Penn State College!). Jens Clausen will return tomorrow from Brazil! A few minutes with Spoehr. Lunch with Dorothy and Bill at the Stanford Cafeteria. Herbert Hoover not there.

531211. WASHINGTON

Arrive weary, in the early morning. Bus to railroad station. No

train till night. Stumbled over to hotel. Slept till ten. Phoned Montreal and home. A movie, a cup of tea. And a long dispirited wait. How lovely Ann Arbor will look, even if it is cold and windy and wet. Life begins tomorrow. The old life that I love. The same man that I was?

DANSEREAU TO HEAD BOTANY AT MONTREAL.—We hope readers of the Asa Gray Bulletin have enjoyed reading Pierre Dansereau's Philippine Journal, which is concluded in these pages. Now with mixed feelings we wish the author well in his new work. It has recently been announced that Professor Dansereau will leave Ann Arbor and the University of Michigan after the Summer of 1955, to take up his duties as Dean of the Faculty of Science, and Chairman of the Department of Botany, at the University of Montreal. We at Ann Arbor have valued his stimulating companionship since he came here in 1950; we are unhappy to see him go, but we congratulate him on his challenging new opportunity, and we congratulate the University of Montreal on their choice.—Eds.

PUBLICATION DATES OF THE ASA GRAY BULLETIN—The number for Autumn, 1953 (New Series, Volume II, number 4), was mailed on 27 July 1954. The present number begins a new volume and a new year, and it is our intention to publish 4 numbers (Spring, Summer, Autumn and Winter) during the year 1955. Librarians and bibliographers should note that although two numbers (Volume II, numbers 3 and 4) were published during the calendar year 1954, there is no volume of the Bulletin for that year: The running heads of Volume II bear the date 1953, and those of Volume III will be dated 1955.

ERRATA—The following have been called to our attention by Drs. Jenkins and Bitancourt, the authors of an article in Volume II, number 4: Page 415, line 2 (of title), for 451, read 450; p. 415, par. 2, line 10, for (2) read (5), for (3) read (6); p. 416, last par., line 9, for (3,4,5) read (2,3,4).

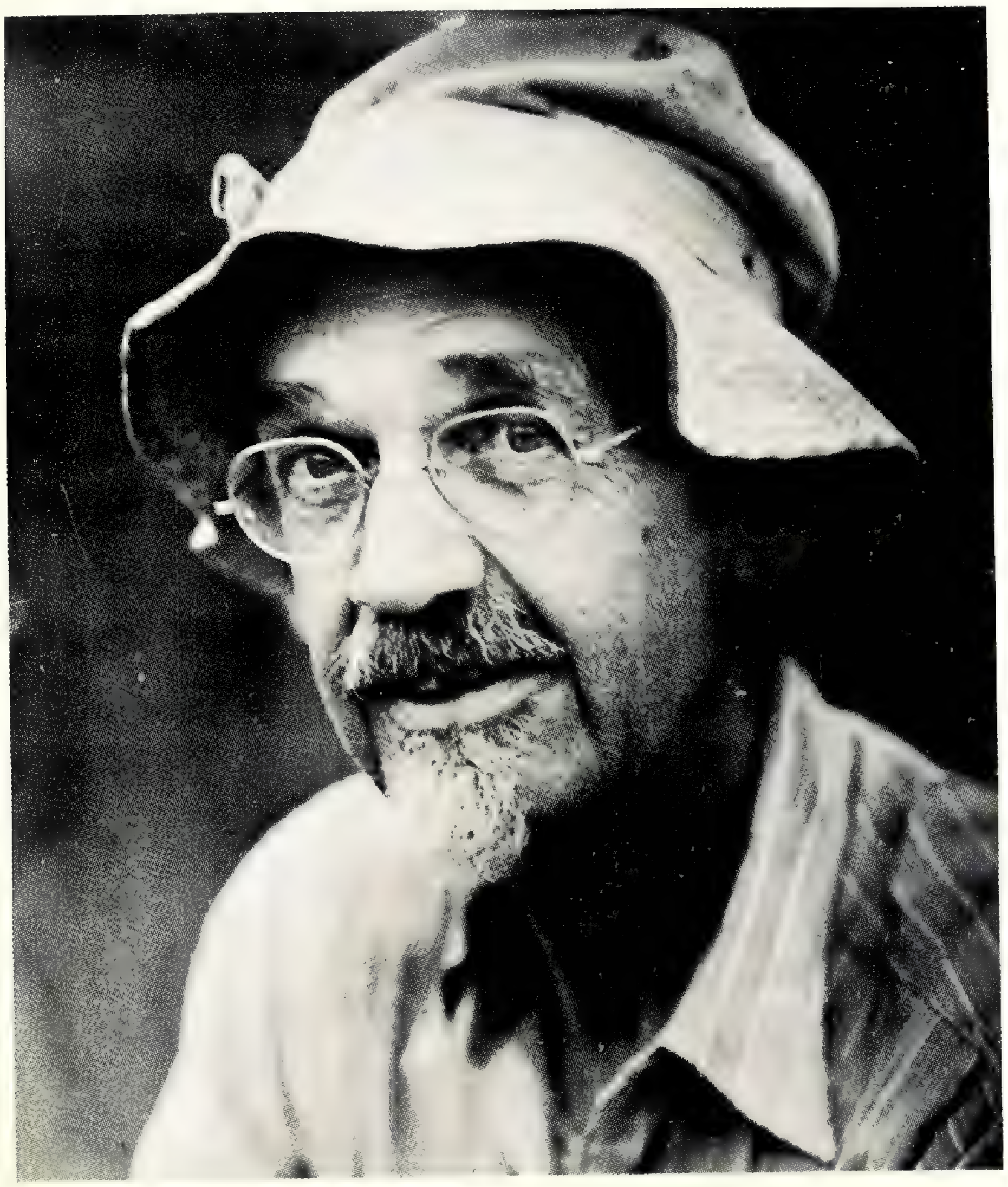
EDITORIAL NOTES — News notes by our subscribers and readers on botanical activities of last year and those now current will be appreciated by the editors of A. G. B. It is especially suggested that general accounts of botanical excursions and expeditions be based upon note-books and diaries while impressions are fresh, and that these be accompanied by some of the best photographs, from which a selection can be made for publication. Each photograph should have an adequate legend, giving such data as careful botanists would find desirable on the label of a good herbarium specimen. In fact, if a picture represents an actual collecting locality, the numbers of corresponding specimens may well be cited. The longer notes, of which authors may wish reprints, should be titled. Short ones will be alphabetically arranged as a group. Informal letters from the field may be published as such, but will be appropriately titled by the editors. Much interest is taken in the news notes by those who do not bother to contribute any themselves!

WARREN GOOKIN WATERMAN, 1872-1952

Margery C. Carlson

Warren Gookin Waterman was born to Edwin Southworth and Martica Gookin Waterman in Southport, Conn., in 1872. He married Anna Mueller, daughter of Martin and Anna Maria Febles Mueller, in 1898. Mrs. Waterman died in 1944. They had three children, Warren G., Alice Southworth and John French.

Dr. Waterman spent his boyhood on the estate of his grandparents in Southport, where he wandered in the woods and along a brook,



Professor Waterman on a field trip at Frankfort, Michigan. Photograph by Jack Van Coevering.

developing the love of nature which persisted throughout his life. He attended Southport Dames School, directed by Miss Smith, who encouraged him to read extensively, particularly in the field of natural science. He did not attend high school, but received a diploma from Bridgeport High school by examination.

He received his B.A. in 1892 and his M.A. in 1907 from Yale University, and his Ph.D. in botany from the University of Chicago, in 1917. He taught at Fisk University, Nashville, Tenn., from 1896 to 1911; at Knox College, Galesburg, Ill., from 1912 to 1915; and at Northwestern University, Evanston, Ill., from 1917 until his retirement in 1937. He was made Professor and Chairman of the Botany Department in 1928.

He was a fellow of the American Association for the Advancement of Science; former president of the Illinois Academy of Sciences; member of the Board of Advisors, Illinois State Museum, and of the Conservation Council of Chicago, the Michigan Academy of Sciences, and the Botanical Society of America. He held memberships in the Congregational Church and the University Clubs of Evanston and Chicago. He was an honorary member of the Evanston Garden Club.

After his graduation from Yale, he took a trip around the world, spending several months in India. He had been active in the Student Volunteers for Foreign Missions at college, and planned to work in India as a missionary, but these plans did not materialize because of an illness.

During his years at Northwestern University, he taught courses in ecology and landscape gardening. Through his contacts with the owners of renowned gardens in the Chicago area, particularly along the North Shore, he gave his students an unusual opportunity for practical study. He was an advocate of natural, rather than formal, garden planting. He often took groups of students to the Frankfort area of Michigan and to the Rocky Mountains for summer field courses in ecology. His principal research interest was the ecology of dunes areas. He studied the region around Sleeping Bear Dune, Leelanau County, Mich., and the dunes at Point Betsie, near Frankfort, and wrote several articles on his work. He also published a book on Plant Communities. During his chairmanship, the botany department grew in staff and student body.

After his retirement, he moved to his farm, River Bend, near Frankfort. He built a home on a hillside, overlooking the beautiful valley of the Betsie River, with a view to the sunsets over Lake Michigan. In the spring and summer, he tramped over the country, studying the haunts and habits of native orchids, and in the autumn, he hunted with his dogs. He probably knew more about wild orchids, especially the showy lady-slippers (*Cypripedium reginae* Walt.) than any other person. He located probably all of the stations where they grow within a radius of 50 miles of his home and visited them at least once a year. He studied the environment, the vigor, the number of flowers and the

increase from year to year, and worked out the life history from seed to maturity. He talked to old settlers about the abundance and distribution of the wild orchids in former years, and crusaded to prevent their extermination by writing articles for newspapers and magazines and by preparing educational exhibits at flower shows. He had accumulated voluminous notes for a monograph on the showy Lady-slipper, and had published two articles in the bulletin of the American Orchid Society.

Photography was one of his hobbies, and he pioneered in Lumière color photography long before the introduction of kodachrome. Coincident with his retirement, he began painting in oils, and his love of plants, of the Michigan Dunes, and of his farm is expressed in his paintings.

On the several occasions when I visited him, I was privileged to share with him the discovery of many a new colony of some rare plant and to learn from his store of knowledge, as we tramped through the woods, bogs, and swampy meadows.

He died at his River Bend Farm, Frankfort, Michigan on November 15, 1952. He was buried in the Benzonia cemetery, in the heart of the country he loved.

Professor Waterman, after his retirement from teaching, transplanting orchids from a habitat about to be destroyed. Photograph by Jack Van Coevering.

A LETTER REGARDING PROFESSOR WATERMAN FROM HIS SON

2018 Orrington Avenue,
Evanston, Illinois.
Thurs. Dec. 4, 1952.

H. H. Bartlett,
Department of Botany,
University of Michigan,
Ann Arbor, Michigan.

Dear Sir:

Your letter addressed to the administrator of the estate of the late Professor W. G. Waterman at Frankfort has been forwarded to me by the post office in accordance with my request. There are enclosed various items which may be useful to you for the project you have in mind.

He was a member of the Agassiz Association while a young man in Southport, Connecticut. After graduating from college, he intended to become a medical missionary but turned to teaching instead because of an injury during a trip to India in 1894. It is believed that he taught Natural History at Fisk University. At any rate, he was teaching Geology at Knox College under Doctor Neale.

At the University of Chicago, he studied under Dr. Cowles and Dr. Fuller, specializing in plant ecology, doing most of his research in the dunes around Point Betsie and Crystal Lake, Benzie County, Michigan.* After going to Northwestern, where Professor Atwell was his immediate superior in the beginning, he conducted several classes in Botany from his cottage at the Congregational Assembly Grounds near Frankfort, during his summers. Professor Alfred Povah was his assistant in Botany at Northwestern for a while.

His collections are at present located in his house near Frankfort, with his notes, pictures and other materials. The will leaves to the Boyce Thompson Institute of Plant Research at Yonkers, New York, the ladyslipper plants and data. This was his chief study since his retirement.

His family had lived in Connecticut for many years. One of his sisters still lives there. His pre-college education was obtained at Southport, as well as at Bridgeport High School. For the best part of his life, he was widely traveled, having continued around the world after visiting India. He spent considerable time in Canada and Alaska, with several trips to the Colorado and Canadian Rockies.

If there is any other way that you wish my assistance in this, please do not hesitate to request it.

Sincerely,

French Waterman

*[Aside from easily located articles in the Papers of the Michigan Academy of Sciences, Botanical Gazette, American Orchid Society Bulletin, etc., he published a pamphlet entitled "Forests and Dunes from Point Betsie to Sleeping Bear, Benzie and Leelanau Counties, Michigan," Northwestern University, Evanston, Illinois, 1922.]

TO BE EXPECTED IN FORTHCOMING ISSUES

Botanizing in the Tahquamenon Area, by Alexander H. Smith

Wilhelm Hillebrand, by Otto Degener

Persian Diary. I, by Walter N. Koelz

An Autobiography for his Family and Friends, by Cornelius L. Shear

Glimpses of the Natural History of Koror, by Peter J. and Alma Hill

Ekman, Botanical Explorer in the West Indies, by Siri Von Reis

Biographical Sketches of Louis H. Jordal, Ray C. Friesner, Charles C. Deam, and Alice Eastwood

Observations on the Edwards Plateau, by Winifred O. Moore

Botanist's Visit to Mount Sisipitan, by José Vera Santos

Letters from Alaska, by Gertrude Frohne

Ethnobotany of Popcorn, by Volney H. Jones

Collecting in the Aleutians, by Walter J. Eyerdam

The Everett G. Logue Collection of Hybrid Oaks, by H. H. Bartlett

Nathan A. Cobb as a Botanist, by Frieda Cobb Blanchard

Expedición Oñate, by John A. Nystrom, translated by Siri Von Reis

Botanical Publications on the Ryukyu Islands, by Egbert H. Walker

Notes on the Flora of Agattu, by Harvey Alfred Miller

Personal Recollections and Military Record of Colonel Valery Havard, U. S. Army

Evaluation of Havard's Botanical Work, by Rogers McVaugh

Sphagnum Flora of the Vicinity of Douglas Lake, Michigan, by Bodil Lange

THE ASA GRAY BULLETIN, NEW SERIES. -- A quarterly publication devoted to more or less informal communication among the members of the three organizations listed below and our subscribers in general. For the present, progress reports of current field, garden, and herbarium work, with readable and relatively non-technical articles in the fields related to systematics, botanical history, biography, and bibliography, will be preferred. There will be special emphasis upon preparatory work for a new "Flora of Michigan". Free use will be made of letters to the Editors (if released for publication by their writers) and of current news notes regarding botanists.

Items for publication should be addressed to either of the Editors at the Department of Botany, University of Michigan, Ann Arbor, Michigan. Contributors of major articles may secure 100 copies of their contributions, at a cost of $1.25 per page or fraction thereof. Covers furnished without additional charge.

Address subscriptions to Dr. Ruth B. McVaugh, Business Manager, 403 Arbana Drive, Ann Arbor, Michigan. Subscription price for Volume I (if available) is $6.00; single copies of Nos. 2, 3, and 4, $1.00 each. Vols. II and III, $3.00 each; single copies (if not breaking volumes) 75¢ each.

THE GRAY MEMORIAL BOTANICAL ASSOCIATION, FOUNDED 1887. — This organization sponsored publication of early volumes of the Asa Gray Bulletin. Later it issued a mimeographed "Bulletin". Its object is to commemorate the life and botanical work of Asa Gray and to assist its members in botanical activity by furthering friendly correspondence and cooperation among them. Interested persons are invited to communicate with the Permanent Secretary, Professor R. Lee Walp, Department of Biology, Marietta College, Marietta, Ohio.

MICHIGAN BOTANICAL GARDENS ASSOCIATION. — Founded in 1925 to include persons interested in promoting the development and current activities of the Botanical Gardens of the University of Michigan. There are no dues, but subscription to the Asa Gray Bulletin is invited. For further information, communicate with Dr. Frieda Cobb Blanchard, Secretary, 2014 Geddes Avenue, Ann Arbor, Michigan.

MICHIGAN BOTANICAL CLUB. —— The membership is about 350, made up of persons interested in the Michigan flora, nature-study, wild-flower protection, preservation of natural areas, and conservation. It has members at large and the following chapters: Southeastern, Bay County, Marquette, Wild-Life (Houghton). For information address Mr. Paul W. Thompson, 17503 Kirkshire, Birmingham, Mich., or Dr. Marion T. Hall, Cranbrook Institute of Science, Bloomfield Hills, Mich.

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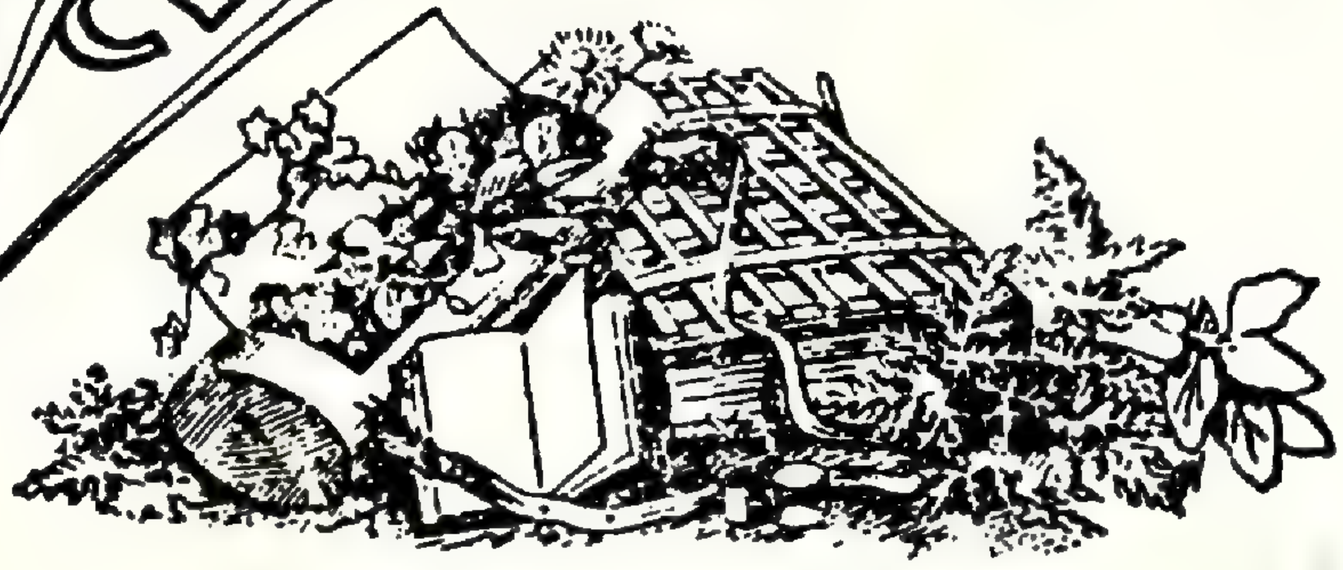

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and
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by

Harley H. Bartlett and Rogers McVaugh

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ANN ARBOR, MICHIGAN

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PERSIAN DIARY. I

Walter N. Koelz

FOREWORD

The "Persian Diary" by Dr. Walter Koelz is sure to interest our readers, and we are beginning serial publication in this number. As a record of travel it will be of permanent interest, for it gives the background for better understanding of the dated botanical specimens which were obtained concurrently with the collecting of useful plants for the Division of Plant Exploration and Introduction of the United States Department of Agriculture. The specimens are being worked over by Dr. K. H. Rechinger of the Natural History Museum of Vienna, whose recent letter follows:

Wien, January 11, 1954

Dear Dr. Koelz:

It was indeed a great pleasure to receive a personal letter from you after having worked several years with your collections from Persia and Afghanistan. I have sent you few days ago all my reprints in which material collected by you is dealt with. It will still last many years until I am through, as I am working out at the same time, family by family, all the material available from Persia, Afghanistan and Baloochistan. I hardly need to stress that your collections are among the very best which ever have been brought back from those regions. As I am still planning to write a Flora of Iran and the neighbouring countries I would appreciate very much to have your itinerary notes as complete as possible. I have received through Dr. Archer, in Beltsville, lists of collecting numbers according to dates and localities visited by you in Afghanistan which complete similar lists received before through Dr. Koie from Dr. Paludan, but I have no notes on your expeditions in Persia. I tried to form a picture of your activities by putting the dates and localities from your labels together but this information seems to be not very complete.

In case you are going back to Iran please let me know in due time so that I may give you lists of places and regions which are in need of more intensive collecting.

I am still in contact with Dr. Gauba. He is just publishing an account of his Persian trips in Annalen des Naturhistorischen Museums in Wien, Vols. 57: p. 42; 58: p. 13; and 59 (under press). His present address is: Dr. Erwin Gauba, Department of the Interior, Parks & Gardens Section, *Canberra* A.C.T., Australia.

Thank you for mentioning the collection from Luristan. I shall write about it to Dr. Rogers McVaugh.

With the kindest regards and best wishes,

Dr. K. H. Rechinger

The reason for publishing the "Persian Diary" now instead of the "Letters from India" which have been announced and which our readers have expected, arises from the fact that Dr. Koelz's long residence in India has been broken by a forced return to the United States and continuation of his interrupted work in India is not certain. Some of the letters might well be superfluous if he were to return and complete the program of field work upon which he was engaged when his activities were perhaps only suspended and perhaps terminated. In any event, the Persian residence is a closed book, and it seems better to start with that.

Dr. Koelz completed his work for the doctorate at the University of Michigan in 1920 in ichthyology, and wrote as his dissertation a monograph of the white fish of the Great Lakes. Always deeply interested in natural history in general, he employed his free time in botany and ornithology as freely as in ichthyology. Until 1925 he was with the U. S. Bureau of Fisheries, and in 1925 represented that Bureau in Arctic collecting, as naturalist with the MacMillan-Byrd Arctic Expedition. The Arctic trip marked the beginning of his addiction to travel, and after his return he was soon off again to New Mexico, where he lived for two years, engaged in study and observation of a sub-arid region.

He returned to the University of Michigan to hold a Lloyd Post-doctoral Fellowship for the academic year 1927-28, and was appointed as State Ichthyologist of Michigan for the brief period that such a position existed. He then became Assistant Curator of Fish in the University Museum (1928-29) but held that position only a few months.

The event which led to his long career in Asia was a request from Dr. E. D. Merrill, then Director of the New York Botanical Garden, to nominate someone to go as Botanist to the institution which had been established by supposedly "White" Russians, directed by Nicholas Roerich, at Naggar in the Kulu Valley, India, and which was known as the "Urusvati Himalayan Research Institute." It was ostensibly a research institution, but when its aims appeared to be more in the direction of political (or *maybe* just theosophical) penetration of trans-Himalayan Asia rather than scientific research, Koelz dropped the connection. It resulted, while it lasted (1929-1932), in the collecting of much botanical and ornithological material, of which the plants went largely to Kew and the New York Botanical Garden and the birds to the American Museum of Natural History, and to British collections. On return to the U. S. A. the University appointed him Freer Fellow in Asiatic Art, 1933-34, which time was spent in making a collection of Tibetan art and ethnographic objects and also a large collection of plants and some 7000 birds. In the interval from 1934-41 he was engaged chiefly as agricultural explorer for the U. S. Department of Agriculture and travelled extensively in India, Afghanistan and Iran. The seeds and plant parts have yielded valuable material for American agriculture.

Regarding what he did in this field I venture to quote the present chief of the Division, Mr. C. O. Erlanson, who has written as follows:

"Some years ago a new disease reached epidemic proportions on the large commercial cantaloup crop in California, where are produced most of the cantaloups which reach the off-season market here in the United States. Resistance to this disease could not be found among the breeding stocks held in the United States. Doctor Koelz was fortunate enough to find near Calcutta a wild, inedible melon which had one superlative quality, as far as we were concerned, in that it was resistant to the disease which was attacking our melons in California. From the handful of seed which Doctor Koelz collected in India, we were able to develop breeding stock which saved the melon industry of California. In published statements which were made after the breeding work was done, it was claimed that this one collection saved the melon growers of California an estimated five million dollars a year.

"The United States is always short in vegetable oils and investigations continue through the years for crops which might produce vegetable oil and which would at the same time give the growers of this country a profit. Among the plants which show promise for this purpose has been Perilla. However, in all the samples brought in from southern Asia and investigated, only one of them produced enough oil per acre to make it worth while. The collection of Perilla seed made by Doctor Koelz near Surag in the United Provinces of India turned out to be a much more highly productive strain than anything we had found before. This plant is still under active investigation, but results indicate that under our conditions it may yield as high as 1100 pounds of seed per acre, and it is from the seed that the oil is obtained. This may become a new crop for the United States.

"One of the great problems in the strawberry industry of this country is the prevalence of virus diseases which are very difficult to eliminate and which, under proper climatic conditions, often wipe out the complete crop of a grower. Near Garhwal, Doctor Koelz in 1948 collected seed of a strawberry which has been re-

ported as immune to all of the virus diseases known in the United States. This material is now being used in breeding for all our commercial varieties of strawberries and, if it proves to be true that it can bring resistance to these virus diseases, it will mean millions of dollars to the growers of strawberries in this country.

"An alfalfa picked up by Doctor Koelz near Dehra Dun is now being used extensively as a parent in breeding programs for this crop, merely because this particular strain has a very hairy stem. One of the pests of alfalfa fields in the United States is a small sucking insect which, under proper climatic conditions, multiplies rapidly and sucks the sap from the stems of alfalfas until the whole crop wilts and becomes useless over thousands of acres. The particular alfalfa strain which Doctor Koelz collected is sufficiently hairy on its stem so that the sucking insect can not reach the skin of the plant to suck out the juices and, therefore, commercial crops with this hairiness characteristic bred into them remain immune from the attacks of this insect pest.

"Seed of a cucumber picked up near Bhavnagar has been found to be highly resistant to a disease called downy mildew, which has been very damaging in the State of North Carolina. The material collected by Doctor Koelz has been used in the breeding programs and new varieties have been developed which are now resistant to this disease.

"These are only a few of perhaps 150 examples of very valuable collections which have been made by Doctor Koelz in southern Asia."

The extensive herbarium material has been used by botanists of the world in systematic revisions and descriptions of new species. From 1940 to 1946 Koelz was in Iran, and in addition to the botanical studies concerned himself with collecting birds and antiquities, and learning the Persian language. In 1946 he returned to India and except for a period of plant exploration for U. S. Department of Agriculture in 1947-9 in that country, he has spent his time in collecting plants, birds and mammals in various parts of India, lately in Assam. The plant collections to date total over 33,000 numbers and his private collection of Asiatic birds numbers 55,000 specimens. His constitutes the best collection in existence of Iran, Afghanistan and Indian Birds.

The Diary relates the general experiences and impressions of one who has lived long abroad and in places far from the beaten path. In his wanderings since 1929, he has been accompanied by his devoted friend Thakur Rup Chand, whom he met under curious circumstances, which may perhaps be sometime related, at the summit of a pass leading into Lahul from the Indian side of the Himalayas. Rup Chand decided almost on the spot that he would rather be a naturalist than a Prince of Lahul, and has been such ever since. He is also, like Dr. Koelz, a keeper of diaries, as those with limited companionship are likely to be, and we may sometime have the privilege of publishing some translations from his pen. He writes as the spirit moves him, in Tibetan, Urdu or English. He has worked independently at times when separation from Dr. Koelz's headquarters has seemed likely to be botanically profitable, and we shall hope to have his Tibetan-border journal of a period when Koelz was working in Nepal. During all these years of travel Dr. Koelz or Thakur Rup Chand or both have been attached to the Botanical Gardens of the University of Michigan as Collaborators in Asiatic Research and the great bulk of their botanical collections have come to us. As a matter of fact, Dr. Koelz's collecting of botanical material began in New Mexico, then continued in the Arctic and then in his home state of Michigan, where, with Mr. Carl O. Grassl, now of the U. S. Department of Agriculture, he studied plant distribution along the shores of Lakes Huron and Superior. They chugged along in a motor boat, starting at Detroit, and covered hundreds of miles in the summer of 1932.

This now seems far away and long ago. Wherever he has been during his whole professional career I have prized the association with Dr. Koelz (his doctoral committee was one of the three first on which I served as a member of the Michigan graduate school faculty) and have kept in touch with his valuable work through the years. I believe that his accomplishments in field work have been the greatest of any general naturalist of our time.

H. H. Bartlett

Map of Iran showing route and places mentioned in the Diary.

PREFACE

This series of continued articles is a selection of pages from my diary, written during travels in Iran on a project of plant exploration sponsored by the United States Department of Agriculture. Its period extends from late 1939 to the beginning of 1941. With me were my three companions from the Western Tibetan province of Lahul who had accompanied me in several years of earlier explorations in India and Afghanistan. The Thakur Rup Chand, known to American newspaper-readers by his Tibetan name of Surja Dawa, had also spent several years with me in the United States. Wangyel and Rinchen Gialtsen made their first sea-voyage on this trip.

The Iran Government received us hospitably and did all possible to facilitate our travels, usually even sending a representative of their Department of Agriculture to smooth our way. These men mostly acquitted themselves of their unwonted and not easy task in a manner that would reflect credit on the citizenry of any nation.

Some 3000 samples of seeds and 4000 collections of herbarium specimens were gathered on the expedition. Many of the seeds were varieties of cultivated plants that will be a useful addition to our seed and fruit-tree catalogs. Others, of wild and cultivated stock, may be used for breeding experiments in producing disease-resistant, drought-tolerant, and other agriculturally important strains of cultivated plants. And among them also are representatives of the numerous species of wild flowers that glorify the Persian plain and mountain.

The days thus spent were happy days and I am grateful to those who helped to make them so. To my friend, B. Y. Morrison of the Office of Plant Introduction, is due the conception of the program and to his skillful administration belongs the credit of its successful execution. My Tibetan companions would be puzzled at my thanks for their part; moreover I can find no words to thank them for a relation that transcends friendship. To the gentle and friendly Persian people I have the pleasantest obligation and perhaps my voluntary sojourn among them is its most convincing expression.

INTRODUCTION

We are going to Persia, Persia the land of Zoroaster, — of a people who saw in fire a symbol of worship, not fire the consumer, but fire the cleanser, fire the emblem of purity and of light. And as the eternal fires lighted their ancient altars, for long centuries after, the fires of genius lighted the Persian soul and the glow of their sunset reflections still lingers. In the years of our wanderings in India our eyes were ever drawn to that western afterflow. For, Circus of Creation as it is, with its sideshows of marvels and horrors, India nevertheless does show the sublimest works of the hand of man and those miracles of man drew from the inspiration of Persia, ennobled, it may be, by the contemplation of the sublimest works of the hand of God, which stand before them, the Himalayas — the mystic "Abode of Snow" that in all ages was the cynosure of Indian philosophers, from which even the noonday sun of Realism has not dispersed its supernatural haze. We had seen the morning sun gild Everest and Nanga Parbat and felt the soul tug to be free in the rare air of the heights before these outposts of the Infinite. We had dreamed in the fabulous flowerstrewn uplands of Kashmere and languished in the oppression of scent and color of Ceylon. To senses steeped in this magic atmosphere the monuments of Persian thought, among which the revelation in white marble at Agra rises supreme, stand in transfiguring light and the comprehension quickens of the meaning of Beauty — that infinite formless Something that hovers above Creation and to which, the poets say, the artist gives a local habitation. And as mankind has ever been drawn by the mystery of Beginnings to worship the river's source or the rising sun or the birthplace of an embodied idea, we were drawn toward the source of inspiration of these things of supernal beauty and turned our steps toward Persia with a pilgrim's devotion.

Chapter I

THE MEDIEVAL SEA GATE AND THE COAST

December 14. The boat that has brought us from Karachi is one of the line that runs regularly into the Persian Gulf and makes stops at all the ports. Our ship is not the gull-winged bark of poet's fancy that is fit to touch the romantic shores of the Medes and Persians, of Babylon and Nineveh and the Arabian Nights, but an old slow steamer as dreary as the barren shores it plods along and with British aloofness never touches. The crew and cargo are also drab, products of India though they be, for even myrrh and sandalwood have nothing of romance about them done up in gunny sacks, nor natives, however shiny-limbed and limpid of eye, if they are dressed in dingy pants and shirt. When we stop and the little boats come from shore to take a box or a sack or two that the shallows don't allow us to deliver, for a few moments there is something to see: a strange rug woven in black and white in one of the boats; a bunch of dates as it was cut from the tree; queer fish that look like Japanese drawings, swimming in the clear water around the boat; but we are soon off again, and the cheerless atmosphere of a country church settles on us once more. It would have been pleasanter if I could have stayed on deck with my friends. They had taken food along for the journey and cooked on their charcoal fire and slept under the balmy sky of the subtropic winter. For me there is a Goese chef's interpretation of the bleak British cookbook and I sleep in a tiny cabin, darkened from fear of submarines. A representative of the United States Department of Agriculture, the subject of diplomatic representations and official reception, must travel first class.

The servant of the British Consul at Bandar Abbas is returning with his master. He has been on a visit to his folks in Kashmere. He complains that vacations cost a lot and you're apt to find things at home changed and not for the better. His brother has died and now he has to support the widow and her children, and he got into a cudgel fight with his other brother. He brought a pot of honey from his village for his master. He got it with his own hands because his master wanted it clean and last night spilled it on the deck and had a bad time scraping it up again. He warned my men not to tell me what had happened or I'd be sure to blab to the Consul. He knew what great folks talked about at the table. At Lucknow a domestic every morning poured water from one glass to another and from time to time plunged his finger in it. We found he had boiled the water and was cooling it. His master would brush his teeth only in sterilized water. Verily,

Wangyel, the Thakur Rup Chand and Rinchen Gialtsen. These three Tibetans have been my constant companions in my long exile in India, Afghanistan and Iran. The Thakur Rup Chand has friends in Ann Arbor and is a staff member of the University Botanical Gardens.

what you don't know won't hurt you. The sea has hardly been disturbed by a breeze in the four days since we left India and Rinchen Gialtsen thinks sea travel is pleasant. Rup Chand knows the horrors of seasickness and told him how a rough sea can make you long for the calm of the grave, but Rinchen Gialtsen is of the opinion that he would find it exhilarating and hopes the wind will blow.

We anchored off Bandar Abbas at nine. The ship's help had been trying hard since supper to catch their two longhaired cats but couldn't. They said enterprising thieves picked up pets and sold them back to them on the return trip. The young Fourth Engineer said he was sorry I was leaving because the food is better when there is a first class-passenger aboard. A group of pleasant Persian officials said they had had telegraphic instructions about us from the Capitol. They asked about nothing but our guns and cartridges and made out a

slip for each gun for me to sign. At midnight they loaded our luggage into a launch and in an hour we were ashore. They took us to a building fronting the sea and lodged us in two richly and heavily carpeted rooms with no wall ornaments but photographs of the King, a fine regal personage, and of the good-looking Crown Prince. A magnificent meteor shower in the northern sky and a hideous chorus of jackals in the street below us, both extraordinary performances of their kind, closed our day and ushered in our Persian adventures.

December 15. Everyone on the ship, even the Kashmiri, had told us what a dirty place the town was and we wondered what filth we should see if an Indian were shocked. The streets, however, look clean enough to us and the sandy beach too is clean. The people are plain-featured, very swarthy and well-mannered. Somewhere in the environs they say are remains of the forts the Portuguese, Dutch or British had held three centuries ago in the days of Shah Abbas, the last great administrator of the remnants of the Empire of the Medes and Persians. Along the beach are plenty of wintering birds, mostly curlews, plovers, gulls and the like and also flocks of oyster catchers that I had never seen before in Asia. They say that there are plenty of fish at certain seasons and the best of them are the *qodr, zalaibi, shirmahi, ghobat, puru, habur, rashku,* and the like. Some Danes have a sardine factory here and put out a good but rather expensive product. Children along the shore are fishing with a basin over which they tied a cloth with a hole in the center. A crushed crab is the bait. When they pulled up they often had a couple of fish, like perch.

Drying Nets at Bandar Abbas on the Persian Gulf. Fish are caught in the Gulf and in the Caspian Sea and very salty dried ones may be found in inland markets. Small and miscellaneous produce is usually dried in the sand without salt and doesn't get far inland. Fresh water fish are often abundant and in the Diz River may be enormous, but they are not much esteemed, and in places not disturbed.

December 16. Some beautiful brown donkeys with smooth silky coats came for us in the morning. We loaded three of them and started off at half past ten for Isin, toward the Kuh Ganu, a rather sizable peak that looks to be some 15 miles inland. The way soon runs over a limestone ridge through which a stream has dug a narrow gulch. In the broad bed of the stream are now pools of very salty water in which plenty of minnows are swimming. The path over the bare rock is deeply cut into narrow troughs, some of them to a foot in depth, often a dozen of them together, where the feet of the ages have

Paths in the bedrock near Bandar Abbas. These grooves have been worn in the rock by the feet of travelers that have gone that way through the centuries. On the Pariz massif near Dorud in Luristan the ibex herds, forced to descend for water in summer, have carved on the cliff face a similar record. Their path is nearly sheer and the marble that records it has been polished to glisten.

worn away the stone. There is little vegetation and what there is is mostly shrubby and grows best in the cracks of the rocky walls. There are few birds too but we found a little sparrow (*Emberiza striolata*) that we sometimes found in India only among the barren ruins of ancient buildings. On the way is a large cistern closed in with a domed roof in which is collected the winter rain. Along the coast the wells are brackish and the water here though fresh is dark and stagnant. A sweet cold drink from a spring is a thing unknown in the desert. Long hewn bars of stone set in the wall provide the rungs of a ladder to descend to the scummy water level. — Isin is a bright spot of cultivation in the broad plain that slopes gently down from the

mountain. There are large groves of date palms, with trees 20-40 feet apart, and tiny lawnlike fields of grain. The houses are humble shelters, often in walled-in gardens, where, crowded together for protection against the blasting desert wind, are found at least a few sorts of most of the subtropical fruits, — papayas, sapistas, citrus, bananas, mangos and even mulberries. There are at least five kinds of citrus, the commonest a lime, a fine fragrant thing that is dried and forms one of the indispensables of the Persian cuisine in all parts of the country. All gardens have at least a few vegetables too: melons are beginning to run; corn is earing; tomatoes and lettuce have been freshly transplanted; purple carrots are ready to pull. In the trees were flocks of large wood pigeons and grey partridges (*Francolinus pondicerianus*) which they call *kamanzil* were feeding along the fields. A black and white woodpecker (*Dryobates assimilis)* makes a living on the palm trunks, which seem infested with borers. They say date palms are set out from root-shoots and come to bear in about seven years. The weather is springy like a fine late April day at home. Clouds floated high all day and in the afternoon heavy storm clouds swept from behind the mountain and with thunder and lightning fled seaward, leaving the desert in a strip a mile wide covered with pools.

December 23. Wangyel guessed that the solstice is at hand from the position of Orion on the horizon. Tibetans call the constellation Golak. The nomad Tibetans have names for all the constellations and keep their calendar by their position in the sky. All the men here wear felt hats that sit in their mop of hair like a bird's nest, often at a right angle with the ground. I hear the hats aren't of their own choice but an item of the King's reforms that are designed to modernize the country. The women no longer are veiled and there is no seclusion of the women as one sees in Afghanistan and India. They say the women liked the veils (*chaddar*) because they could wear what they pleased under them, and for prostitutes the institution is a heaven-sent blessing, since no one can recognize them. That it gets sweltering-hot under the airproof garment that constitutes the *chaddar* and that it seems impossible to keep it clean doesn't detract from its popularity.

There was a shower yesterday and they are planting grain. We left Sabi or Saadatabad (the reforms mentioned above have reached even the names of places and any number of towns, streets and even the country itself have changed names) for a trip among some of the date-growing villages, to rejoin the Bandar Abbas-Kirman road after four days of march. We sent what we didn't need on ahead by truck and set off across the plain to Patku. For a few miles the plain is strewn with tamarisk trees that harbor a little owl (*Athene brama*), last seen in India. The tamarisks here are scrubby but in other parts of the south they become well grown trees two or three feet in diameter. When the tamarisks petered out the desert became soft and

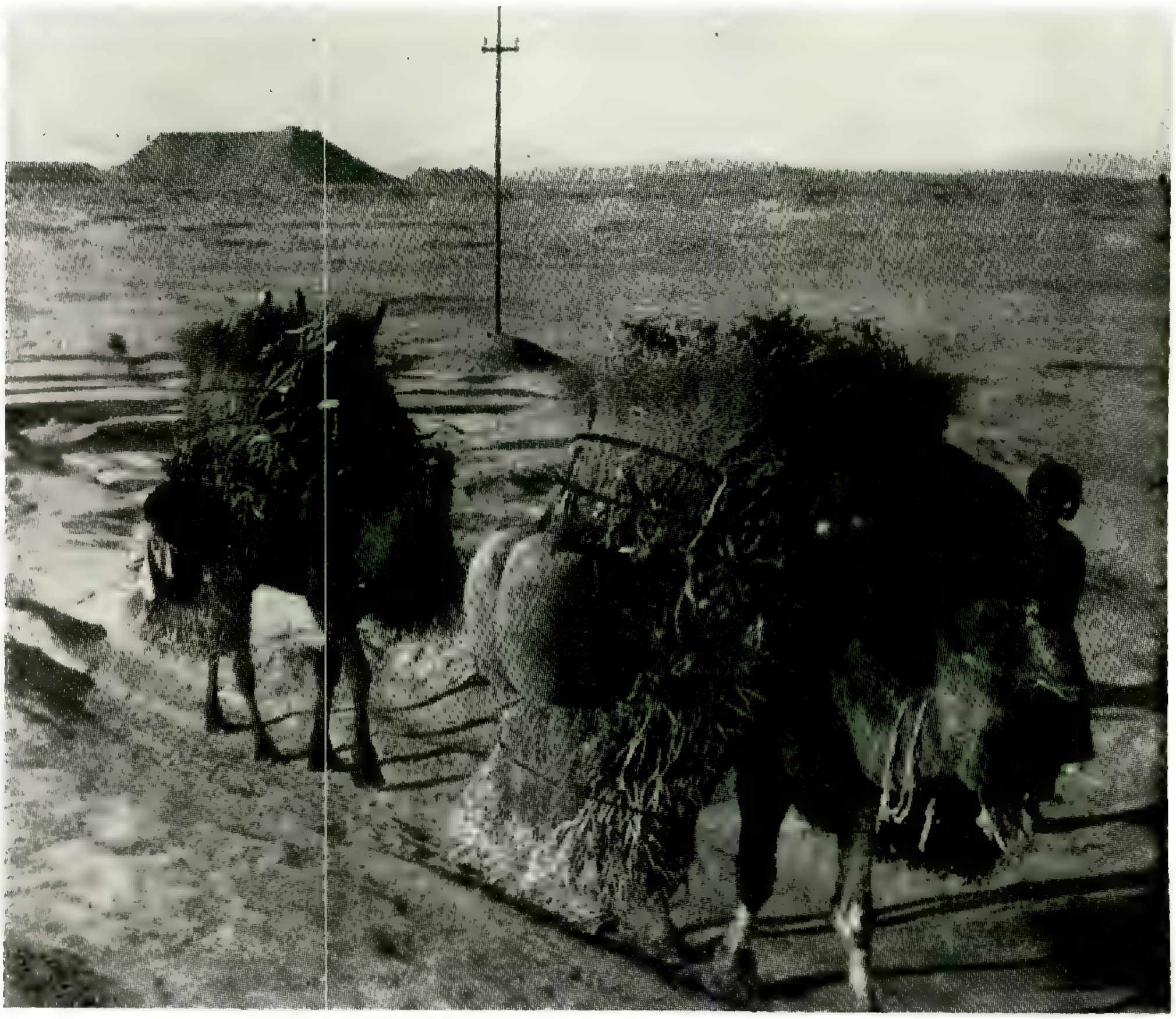
A landscape like this might be found anywhere in Southern Iran, that is, if mountains were somewhere near, whence water could be brought to irrigate the dates. The donkey is the commonest and cheapest mode of transport in the area, and the little traffic the traveler meets in the great spaces of the desert is sustained by this admirable beast. In some places there are fine breeds and some people ride animals of which they are obviously proud, but too often it is otherwise. The normal load the donkey is expected to carry is about what a horse usually does, and it is no rare sight to see the owner riding on top of the load, as here. The goods are carried in bags, woven, in pairs, of goat hair usually, and are thrown across the animal's back.

springy and the walking therefore a bit troublesome but my Tibetan friends seemed to like it. Heavy alkali content often gives the desert this physical quality and the vegetation then is of low and fleshy halophytes. Five bustards (Persians call them *ahubareh;* the scientific name is *Chlamydotis mcqueenii)* flew up almost at our feet, and we wondered how they managed to conceal themselves so well. These same birds usually are unapproachable in the open. I have noticed birds that can hide well seem to know when they are hidden. The chicken tribe are particularly clever at disappearing, large and bright-colored as they are, and I have several times seen them in the Himalayas freeze themselves into inconspicuousness against a tuft of grass or in the open on the leaf-strewn ground. There were plenty of

pig and gazelle tracks and once we came near three gazelles (Persian *Aha)*. Patku is a village of a few houses surrounded by date palms and with a few huge wild jujube trees. As always, a pleasant clean place was ready for us in the second story of the best house. The owner had apparently gone somewhere else to make room for us but the goats didn't know it and when they were brought home in the evening, in spite of all the shepherd boy could do to stop them, they got up the stairs to their usual quarters. We had some nice dates and good rice, said to be grown here. They say the rice has to be watered every evening and one wonders how they can spare the water in such a desert.

December 25. Teserj. We went down to a huge spring that comes out at the foot of a low cliff. A strong stream, usually too deep to wade and 10-15 feet across flows from it and cloaked in cattails and bulrushes runs out of sight among the bare rocky hills. There are plenty of fish in the stream, some probably 8 pounds in weight, and in the swampy border are numbers of wild pigs. No one seems to bother them and I came upon several monsters at thrillingly close range. There are plenty of black partridges (*Francolinus francolinus*; Persian *toraj*) among the cultivation and we were surprised at finding such a hunter's paradise. It seems fish in most parts of Iran are not often eaten and pigs of course are forbidden by the Muslim religion, while the partridges are too difficult to shoot with the sort of guns the natives would have, if they should happen to be allowed any at all.

I was called to see a wounded man, bedridden with hideous gashes in the thighs. He said a boar had attacked him when he ran into him (the boar) asleep in a dry irrigation ditch. The wound was old but clean and was healing nicely. A boy had a lesser wound that he got yesterday when he surprised a sleeping pig among the rocks. It seems that people often are attacked when the animal is taken unawares and doesn't see a clear way to escape, but since then, I have seen an old boar leave a travelling herd on the open plain and take after a peasant he happened to catch sight of, with no provocation at all. The peasant ran for his life and the pig chased him a few minutes but probably only because he ran. The wild boar we later had as a pet in Persia delighted in chasing anyone who would run from him but never hurt his victims even if they fell in their terror. He waited instead till they got up again and then started off after them anew. He especially liked to stampede donkeys and I have seen other wild pigs attack them too. Donkeys seem to have a natural fear of pigs and Piggy was the cause of many a donkey-rider's being dumped in the dirt by his frightened mount. — The soldiers who are escorting us found no sugar here so we have to move on to the next village. (Persians must have sugar for their indispensable tea and here the people use dates instead, but that savors of poverty.) News has come of brigands in the neighborhood and our guard has been increased to ten, a fearful



The camel is the desert truck, as the donkey is the desert Ford. Camels and goats are the only domestic animals that you seldom feel sorry for. Both beasts are able to wrest what they need from the parsimonious desert and bear well the demands of their host. The camel by his size and wit has established his position in the transport scheme as satisfactorily as the Brotherhood of Railway Engineers, and more permanently. He gets what he needs. He gets no abuse, because he tolerates none. This caravan is bringing forage. Loads are commonly prepared in two flaps that straddle the animal's back. It is convenient to load and unload such packages. The method of loading, however, varies from place to place, and the various methods are not equally effective. The path has been marked by hoof wear, but, if it were not, an experienced camel would find the way just the same.

visitation on a small population and we feel we must hurry along. There is rich black soil in the valley and the date palms thrive.

December 28. The truck had stood all day without anyone thinking of making any repairs. Cars are often not disturbed, even to the extent of refueling, as long as they will run, and such treatment may make things unpleasant for travellers. Hardly out of the town our car balked and for the first couple of hours we got as many miles. When at last stops were no longer necessary we began, out of habit probably, to stop all along and for long periods at small adobe huts called "coffee houses." We had a place on the dates our truck was hauling and

could stretch out and rest so the stops didn't matter. Our Persian friends preferred the seat with the driver and they always got out and went in for refreshment too. After these halts everyone came back happy and laughed at our snoring, and off we went again till we got to another of these entertainment places. In the morning we arrived at one of the villages of the Sirjan group and had breakfast. The Persians borrowed our .22 and shot some desert larks which they plucked and roasted. We offered them some partridges that we had killed but since we hadn't cut the throat as their religion requires the flesh wasn't edible, wasn't what they call *halal*. The Mohamedan religion enjoins its followers to eat meat of no warm-blooded animal that hasn't died by having its throat cut "in the name of God." In the case of game, that often is dead when you get to it, many people are broad-minded and perform a post-mortem throat-cutting. The town superficially seemed to be a collection of ruined mud walls and numbers of little desert owls were sunning themselves on them. I wanted a few for my collection but the first one fell into a bottomless well and the next stuck on top of a high frail wall and was as inaccessible as the first.

At ten we got to Sirjan and were taken to a large public building in a huge garden apparently newly laid out. A nice-looking youth who is the agricultural agent here later invited us to his home to lunch. His room was hung with embroidered and woven shawls of the style sometimes seen in India and there recognized often as Persian-made. The material from which shawls were woven is "cashmere" (Persian *kurk*) — the soft underhair that some kinds of goats develop in winter. The Indians wove their shawls from such goat hair brought from Tibet, where it is called "*lena*," Urdu "*pasham*," and aside from the fact that the style of design of Indian shawls is different, they are usually softer in texture. The Persian *kurk* resembles very fine wool. They say shawls are still made in Kirman and Yezd and one often sees furniture upholstered in a shawl-like material said to come from these places. The old shawls seem to be rarer here than in India and those that show up are most often quilted squares said to have been used in the bath.

The youth apparently had expected us and had prepared a wonderfully varied and well cooked feast. Already on the table were the "*ajeel*," a collection of hazelnuts, *pistas* (English pistachio) and watermelon and pumpkin-seeds, all roasted and coated with salt and turmeric. "*Ajeel*" is very popular in the country and an important social institution. The host puts his guests at ease by employing their hands and teeth, which is the best he can do without a radio. Tea was served with short cup-cakes and a strangely scented marshmallow-like cake, with disks of a kind of butterscotch. Tea in Persia is served everywhere, even in public offices, and you can hardly make a call in one on any matter without being offered tea. Certainly you will have tea if

you call at any house, however humble. It is served in small glasses, silver-based if possible, with cube sugar or loaf sugar on the side, which the Persian often puts in his mouth and dissolves with the tea. Porcelain tea-cups may be offered at important social gatherings and often then lemon slices as an accompaniment but I don't recall ever having seen milk. The custom of tea drinking is said to have been introduced from Russia about a century and a half ago. Then followed several courses of meat, — mutton, chicken, quails, with *pilo* — buttered boiled rice seasoned with saffron, almonds, pistas, currants. *Pilo* (English pilau, supposed to have come in from Malay) is a staple Moslem dish and the decorative elements vary, but fat seems to be a weighty item. The Persian, like the Afghan, likes grease and also sugar and it seems nothing can be too greasy or too sweet for his palate. I have been served fried egg-plant drowned in melted butter and smothered in cream and the dish was stone cold to boot. Jaundice conditions are common among them and the cause is ascribed to burnt food, which is of course accordingly avoided. I have never seen a Persian who wouldn't, I believe, sooner eat a spider than a piece of burnt bread. They also have a horror of dust, though heaven knows in this desert they see and breathe plenty of it, but especially they dread dust raised by the broom. Toward the end of the meal a pink quince-preserve was brought in and vodka scented with lemon, and such fruits as still were in season, apples, pears, grapes, pomegranates, melons.

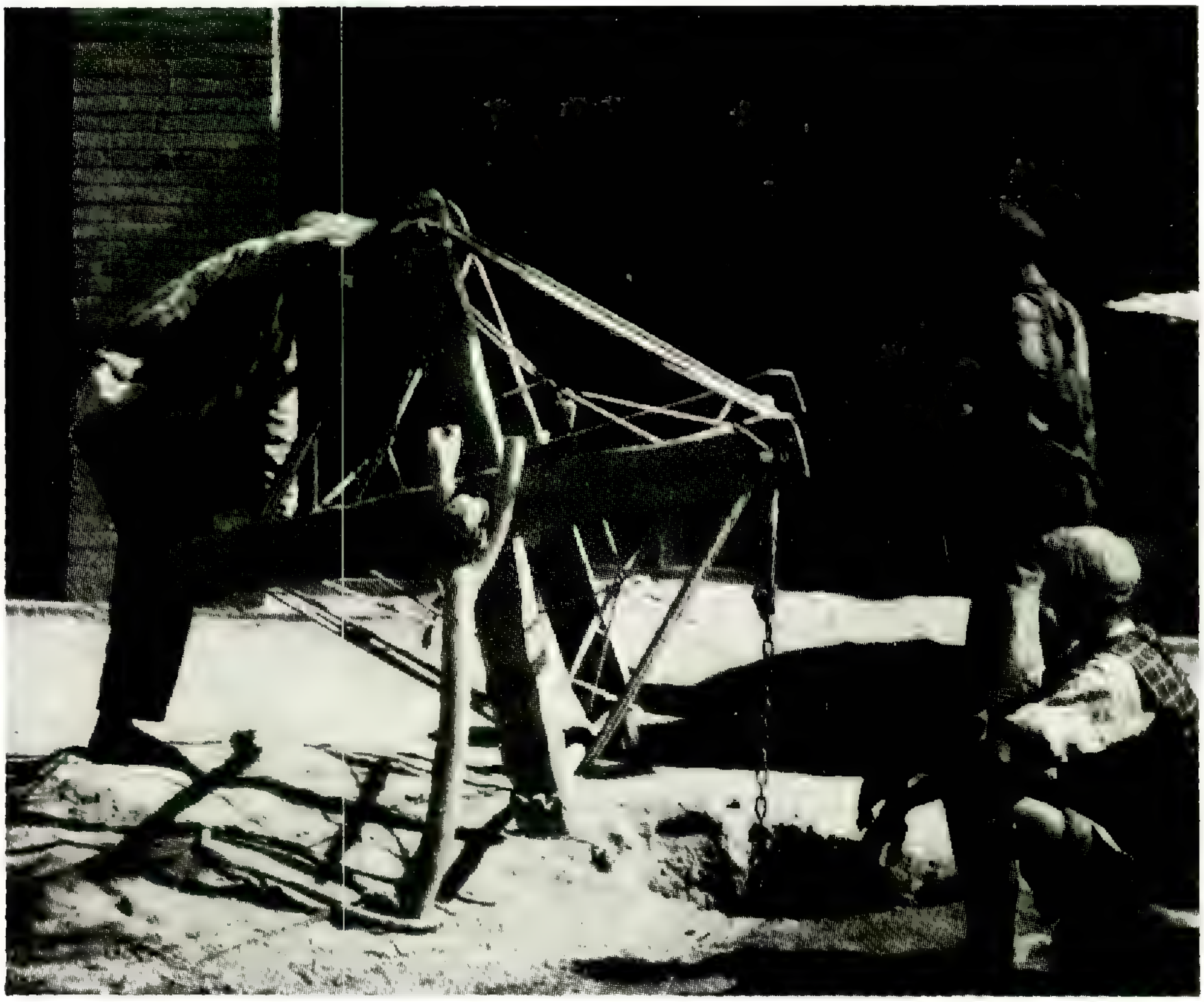
In the bazar I found my size in *giveh*, the comfortable native shoes so commonly worn. They are made ankle height, without laces, of white cotton thread crocheted onto a sole. The sole may be leather, sometimes a piece of old auto tire, though rubber soles are believed to be bad for the eyes, but in some places a special sole is made of small strips of rags pounded down and strung on thongs. The quality of the *giveh* depends on the fineness of the thread and the sole. The nicest have a design crocheted on the toe and around the top. For ordinary wear they are durable and of course can readily be slipped off and on — an important consideration for people who don't like to carry the dirt of the street into their houses.

I went then with three of the young men of the company to look at the cultivation. The gardens were all walled in with mud walls 10 feet and more high, but people were friendly and always let us in when we asked. Many had only bushtrees of *pista* 10 to 15 feet high; some had trees of apple and other deciduous fruits. The trees were widely spaced and grain had been sown under them. By mistake I used a cartridge Rup Chand had loaded with lead slugs, in case he came onto a pig, to shoot at a little owl and missed ignominiously. All three boys volunteered to do the shooting henceforth so I gave one the gun. He asked where to aim. I said at the head and with the first shot he got two crows. He gravely examined the corpses and seeing blood in the

mouth said he had hit where I had told him. Persians seem to like guns but no one we ever came across showed any skill in handling one. Just now their possession is much restricted in the country and the contraband sort are apt to be of ancient models and not suited for displays of skill. We have, however, almost everywhere been told of remarkable feats that are commonly performed, such as shooting a dime in the air with a revolver, and very often some one has told us that when he owned a gun, in the days before the government disarmed everybody, he used to shoot game half a mile away: we tried always to get too close.

The agriculture officer knows some French and calls me *"Musoo."* Many people, even peasants, know so much French as that and we are generally called that or something like it. French is the foreign language most commonly taught in schools, and many educated people know it. Numbers of Persians of both sexes have been schooled abroad, mostly in France. The little son of the caretaker of our building who has been watching our housekeeping, prodded by his father, greeted me with: "Bon soir, monsieur, comment allez-vous?" When I obviously understood him, the father nearly burst with pride. He knew one more French sentence that had, however, no conversational value. — The town is the usual uninteresting accumulation of mud-walled one-storied houses and lies in a plain perhaps 50 miles across, with mountains all around, those toward Kirman and Shiraz snow-capped.

December 29. A youth from the agricultural office came this morning to take us over to Ahmedabad, 9 miles off, where they said there was good hunting. We have had to emphasize the hunting or else our guide would hustle us across the landscape with the promise of having all the seeds we could want sent after us, and it works out all right because the best hunting is in the best-cultivated regions, since food for game is more abundant there. The plain is strewn with rows of mounds that mark the course of a *qanat* or *kariz*, the underground channel through which irrigation water is conducted, often for 10 or 15 miles, across the desert. The amount of labor in making such subterranean channels may be imagined. The excavated earth is brought to the surface in pails on a windlass through shafts, like wells, sunk at regular intervals and the mounds are the sites of these shafts. Here the streams run about 50 feet underground, but I have been told many are much deeper, even (at Yezd) to 300 feet. The upkeep of a *qanat* is much less than of a surface ditch since these are always being clogged by plants and by the perpetually drifting dust of the Persian desert that has buried even great cities so that their site is unknown. Then there is the colossal loss of water by evaporation under the thirsty air, pilfering by plant volunteers, and seepage through the walls of the ditch. The *qanat* channels appear to be well cemented with minerals precipitated out of the water they carry and probably lose little to the



Digging the shaft of a qanat. The underground irrigation canals that water many of the Persian settlements are dug by sinking shafts and burrowing in both directions from these shafts. The digger is in the hole and signals when he has a load of earth to be hauled up. The qanats run commonly for 8 or 10 miles, and the shafts, though ordinarily not more than 50 feet, may be much deeper. The strings of mounds that mark their course on the plain are a common feature of the Persian landscape.

surrounding earth. *Qanats* are seen almost everywhere in desert Iran and I had once seen very shallow ones too at Mukur in Afghanistan. One often sees numerous blind chains marking *qanats* abandoned and left to fill in, the people say, after the massacre of the population in the course of the savage wars that swept the country. In places these ruined systems are more numerous than those now in use and from this it has been argued the ancient population of the country was greater than now. Certainly the population may be in proportion to the water available for irrigating the land, for the country is fertile in general and the amount of land now under cultivation is proportionally as insignificant as the pupil is to the rest of the eye. The *qanat* wells or shafts are usually left open and naturally all kinds of hapless animals fall into them. Fish are usually to be seen at the mouths. Without the *qanat* great stretches of Iran must remain desert waste.

Our companion often asked the peasants we met how much farther it was to Ahmedabad and one boy showed on his finger the proportion between the distance we had come and that yet to go. Near the village there were nice fields of grain, some neatly planted in rows such as I never had seen anywhere but in Japan. Almost everywhere from India to here the seed is broadcast and then plowed under. Plenty of the fields had been planted to cotton and the yard-high stalks were still standing. There were flocks of sand grouse in the stubble, some great blue herons on the dry plain and flocks of green-winged teal in the green grain. We walked from 8 to 5. Our poor friend who wasn't used to such exertion nevertheless firmly refused to hire a donkey, though we said we'd ride too, and we got him home with no more visible effects of his excursion than a fiery face. He hadn't recognized the town from the distance and thought we ought to turn sharply to the right.

People here are very interested in our doings. A crowd of both sexes sit and watch our activities and from time to time make comments on the plants or the birds. A soldier said it was a sin to shoot wagtails and I can quite understand how he got the idea. They are pleasant to look at with their neat black and white bodies seemingly so delicately balanced on wiry little legs and then they are so cheerful and friendly in habit. They commonly come to open pools and streams, even in city patios. At Karaj they fed at our window box and nested somewhere on the roof. The doors in our room are of plane-tree wood (*chenar*) of beautiful grain but said to be frail. In the market there are handsome fragrant sweet quinces, 5 inches through, two kinds of good pomegranates, nice large walnuts. We found no cucumber nor cabbage seed in our search. Cabbage is a rare vegetable in all the countries of Asia I have visited but cucumbers are usually found everywhere.

Chapter II

KIRMAN AND THE GREAT DATE OASES

January 3. We left Sirjan for Kirman yesterday on a truckload of dried limes that is going to Tehran and had to change over to a truckload of stovewood at a town 5 farsakhs from Kirman at half past two this morning. Distances in Iran are measured in farsakhs (about three miles) but most people know kilometer too, though no two people seem to have the same conception of either one and my ideas on both are completely different from anyone else's. After an hour we started off, breezily and perilously perched on a top-heavy load of twisted limbs that writhed and slipped under every jolt of the road. Soon something fell off. The driver made an imprudent attempt to

back up for it and sent one wheel off the shoulder. The load tottered and for a horrible second threatened to catapult us off into the dark and the desert. Unlocked by the sway, the sinuous limbs slid sharply and with a lurch shifted the balance of the load to the other side and we stayed up-right. Someone walked back to get what had fallen off. Then the car broke down and it was 8:00 when we got to Kirman. In the dismal dark of early dawn we plowed through swarms of donkeys that were bringing loads of dry desert plants to town to sell for fuel. They would arrive before daylight. I could not see why one need thus take Time by the forelock and the sight depressed lower still my weary spirits. I dislike to get up early myself and therefore feel sorry for anyone who does. Even when one surmounts the natural sloth that makes him loathe to leave his bed untimely, there still is the cold, the wet, the dark, and the loneliness, and the need must be great that can drive one over all of these.

Kirman lies at one end of a great plain walled in by chains of barren mountains. Here and there at the base of the enclosing wall where springs give up the mountains' hoard of winter water small villages can be seen, and here and there too over the floor of the desert plain are scattered spots of cultivation, if *qanats* have brought down from the mountain some hidden stream. With this you have the setting of most of the towns of Iran and the only variant is the quantitative one: the spots of cultivation are fewer or smaller and the distances less. The urban beauty treatment that has come in vogue with the new "era of progress" has done little more to Kirman than eyebrow-plucking and its pleasant Persian character has not been blotted from its weatherbeaten old face. Poor and humble it is, to be sure, but poor and humble it still would be even if the streets took on the metropolitan mainstreet width that, with the erection of a two-story government building or two, has face-lifted most Persian towns into staring frights. How much better warm water and a soapy rag would have been and afterwards maybe a little judicious rouge. The old roofed-in bazar still stands — the word bazar is properly used only for this section of commercial life of a city that has the streets covered in and thus in summer is sheltered from the heat and in winter from the snow and mud and provides an advantage in the bitter struggle that poverty-stricken Asia wages without end against the elements. Whatever is on the market is to be had in the bazar and that isn't much besides the staple products of the country. Such inexpensive articles of foreign manufacture are found as the simple housekeeping and husbandry require and a luxury or two in the way of some good foreign cloth or a fine assortment of common German drugs, but the bazar of most towns of all the country couldn't compete in variety of stock in general with an average Woolworth store and would be sorely worsted in a competition of quality. Goods are offered for sale piled on shelves or on the floor, in small rooms or booths fully open to the street and often with a living room joined on behind, and it isn't

A Kirman Oasis. The settlements in all of Iran, except along the Caspian Sea, are like this, larger or smaller, as the supply of water is more or less. Here the magic fluid is brought from mountain springs by canals, their course marked by the pollarded willows. The bridge is of several centuries ago, probably from the reign of Shah Abbas, who left many architectural monuments throughout his realm. It is a winter landscape, else there would be no clouds.

necessary usually to go inside to do your shopping. If the proprietor is out he generally indicates his absence by hanging a piece of cloth across the front of the booth. The cloth covers only the lower part of the opening and you can see that the shop is empty, but without the cloth you might think the owner was in the backroom or at his neighbors. — The buildings are of adobe, of one story, with domed roofs and arched doors and windows, and the limitations of materials have not prevented the attainment of grace and dignity. Often the houses are set in walled-in gardens that have shrubs and trees: pines, cypresses, Judas trees, or a willow with fiery branches like a red osier

and their tended freshness bespeaks a love of home that in the East is not so often manifested in this way. We were shown into one of these gardens and lodged in two pleasant rooms that as usual were heavily carpeted. A friendly woman hastily made a blaze of straw in the stove, apparently as a symbol of warmth and welcome, and said her husband would be along in a minute to see what else we needed. Outside in the garden petunias and calendulas still defied the winter with a stray flower or two, while a Judas tree and some narcissus were already welcoming the spring with theirs.

My first business was at the bank and Nikbur asked me as tactfully as his simple nature allowed him to wear the nice clothes I had on yesterday. Clothes are as important in these parts as in others and I often have to be reminded of it. In the Himalayas a Tibetan horseman once told my men to ask me to wear better clothes since my appearance touched on his honor, though nobody could see how, except that servants are proud of the figure their masters cut. Indian servants, for example, take great pride in the quantity of their master's luggage, though often it is only a headache for them. On that score at least no

Deh Shib in Kirman. The houses in the Kirman settlements are often single, not clustered into the defense unit that constitutes the usual village of this part of the world. The walls are solid and built with care. The openings are arched in the typical manner of the country.

servant of ours ever had cause to complain, for however hard we tried to go light, carrying for subsistence and comfort only the minimum that seemed scant even to the Tibetan nomads, we inevitably accumulated great bundles, bags, and boxes of specimens so nondescript in appearance that we were sometimes taken for one of the numerous wandering groups of jugglers and dancers that roam from the Himalayas to Afghanistan. These wanderers travel with their miserable goods tied on donkeys, and with a following of curs and children. Invariably there is in the caravan a corded wooden bedstead under which its donkey bearer is completely hidden so that it seems to be floating along by itself except that the several hens always to be seen tied on top stagger and totter from the jolting of some unseen cause. Our resemblance to them wasn't quite complete but the difference must have seemed small because we were even asked now and then to give a performance of our skill. The bank manager spoke German well and gave me 17 rials for my dollar. In the produce market there are the usual winter vegetables and late season fruits, and also plenty of two kinds of wild partridges. There are good tangerines, a sort of Valencia orange, a fine orange-colored lemon that can be peeled and segmented like a navel orange, very good pomegranates, and a few watermelons, still edible. Pumpkins, of the sort we call Japanese, are common; cabbage is tender and mild; the carrots are a foot and more long, smooth, black, purple, or yellow. Potatoes seem to be rare and are, I understand, not much eaten, except by those who have nothing else. It may be that they don't know how to use them in their diet, for after all you can't do much with a potato without milk, fat, or gravy. Beets and turnips are a godsend to the poor and are sold steaming hot by street-vendors. Here the people usually raise their voices to make us understand better; at Balvard they often whispered.

January 7. The village of Deh Bala lies a few hours walk from Kirman, well hidden against the bare hills in an enlargement of the valley. The name means the Upper Village and there must be dozens of settlements of that name in the country. Hussainabad, Yusafabad, Aliabad, Mohamedabad, and the like are also much multiplied designations, perpetuating as they do the names of popular religious figures. Huge fig trees grow about 18 inches in diameter, often five or more in a clump, tall and vigorous as an old apple tree. I had hitherto seen only fig bushes. They said the fruit was of three kinds, but no samples were to be had. Somewhere in the neighborhood of Kirman excellent figs are grown because medium-sized, sugary, and nearly seedless fruits were found for us in the city, and we were assured there were even better ones. Figs are a popular fruit in Persia and there are numerous varieties, both cultivated and wild. Some of the latter are as good as some of the cultivated kinds. Most of them are eaten fresh and only in relatively small quantities are high class dried fruits to be found on the market. From the neighborhood of

A Figtree at Deh Bala, Kirman. Figs are common in Persian gardens, even in the cold parts, and in places they grow wild. The fruit is variable in quality in these wild growths, often edible. Figs are usually bushes, and rarely do they grow to such trees as these. The large trunks in the background are mulberry. Walls are usually higher than these. They must be high enough to keep the goats from climbing over and are sometimes high enough to keep out men.

Kermanshah come the greatest quantity of these, prepared by packing in a leather sack with sugar or flour sprinkled between the layers of fruit.

The houses of the village are small, well built, with nicely domed roofs and ceilings, and well-modeled doors and windows. The rugs on the floor of our room were nearly worn out — of excellent colors, but as different in design from what we call "Kirmani" in the United States as is a Navajo blanket. It seems these rugs with the insipid flowery design are of a type that suits the luxury trade and the people for

themselves weave something simpler and more artistic. They took us to see the rugweavers at work on a pair of room-sized rugs that they said the Shah had ordered through a Kirman contractor. A design had been drawn up on cross-section paper, colored appropriately, and this pattern was now in the hands of three men who were singing to two looms, behind which sat men, women, and even children, some of them not more than ten. We could see nothing but the back of the rug with its pretty vine design and the fingers of the weavers flying through the warp. On the ends where the weaving was most intricate sat adults. Not even Ali, our companion, could understand the chanting instructions to the weavers so we never found out how the individual sorted out his particular grain from the chaff of confusion, and we wondered no less how the reader followed the tiny squares of the pattern without a pointer to aid the eye. While a reader let me examine his script a woman had to wait. Then he asked: "Where was I?" The woman said something and he started singing again. A baby was asleep in a cradle and a granny was minding three others. They say a man can weave about an inch a day over the stretch of about a foot that is his field to weave on.

The wage they get for weaving is only enough to sustain life and the misery of the creators is a strange comment on the beauty of the thing created. But the people didn't look unhappy and there came to mind a conversation I overheard once between an Irish girl and Rup Chand in America. They decided Tibet and Ireland were indeed poor, but said the lassie: "You didn't *think* you were poor, did you?" These people have handsome soft dark eyes and look as if they were capable of doing nice things.

We got off at nine, though we were ready at seven (no one would have been able to explain the two hours delay), and were soon at the top of the pass. From there the descent is continuous and rather sharp, and after about 10 miles we came to Mohamedabad where our donkeys were at home. The *qanats* were rarer today. Yesterday near Deh Bala they were running grist mills with *qanat* water. The water is led out of its subterranean channel to drop into a deep pit (*tanureh*), in the bottom of which the mill is built. In the Himalayas one would never have found such an ingenious application of water-power principles to these simple mills. Some of the Himalayan villagers are so stupid they haven't even thought of a hopper for feeding in the train and do it by hand. The most interesting thing I remember anywhere else about mills is the practice of some Western Tibetans of using beef shoulder-blades to make the paddles of their water wheels.

Wangyel came down from the mountain and said there were snowcock here, and sought to convince us with a handful of porcupine droppings! He has lived all his life among snowcock and porcupines and is a good hunter besides. Such stupidities as this and even more amusing and surprising ones he exhibits from time to time, but in dealing with

people he has the uncanny sharpness that is characteristic of his race **from whom the human heart has few secrets.**

Dugout Homes of the Desert Poor in Kirman. Trees and stones are not always available for building in the desert and these people have managed to make shelters with simpler materials. These houses that look like great termite mounds have two apertures, one for tenants, the other for the smoke. The desert vegetation is shrubby and abundant, but not abundant enough to support cows. They have a feeding place in the reeds lower down.

January 8. There was a pair of bulbuls* (*Pycnonotus leucotis*) in the garden, which indicates a warmer region, and indeed though the day wasn't warmer than at Kirman, the night wasn't so sharp. Ali said his heart sank (in Persian idiom "his times got bitter") when the order came from Tehran for him to escort the American scientist. Perhaps things turned out better than he expected, or he wouldn't have told me.

*Bulbul is the vulgar term currently applied by ornithologists to some kinds of birds of the family Pycnonotidae. To the Persian the *bulbul* is the nightingale.

The way today they said was 8 farsakhs and added for greater lucidity that it would take from dawn to dark. There is a shortcut over the mountain that the donkey drivers didn't want to take, but I went that way, along with Rup Chand and two of the three soldiers who are accompanying us. The mountain is of marble, nearly bare, steep walled, and since we are headed for the date district, the descent was longer than the climb. A road has been made that donkeys apparently can go over, since we met two bringing onions. The soldiers weren't so surefooted as the donkeys and had some trouble going down. Fuz, at the foot of the steep descent, is the first settlement we came to. A wild rambler had crawled 10 feet up into a fruit tree. A boy said its flowers were yellow and about 2 inches across. In the gulches here we had seen bushroses with still an occasional single pink bloom, but not since northeastern Afghanistan, where wild roses are enormously varied, do I remember having seen a yellow rambler and the flowers of that rambler aren't much bigger than a dime. There were plenty of woodpeckers in the orchard, a black thrush, and numerous flocks of chukors (*Alectoris graeca*). The latter were fearfully shy, though it doesn't seem likely they are much hunted here. In parts of the Himalayas they are also inordinately shy in the fall but tame enough in spring. We often found even the small birds on the Tibetan plateau very wary, and almost everywhere in open country it was more difficult for us to approach birds than for the natives to whose style of dress they had been accustomed. Springs that rose in the village joined to make a little stream that received other reinforcements on its way down the gulch and soon made a pleasant rivulet bordered with oleander bushes and lofty clumps of grasses. In one of the earth walls of the gulch some caves had been dug and several donkey caravans were having lunch. Their owners too were lunching and invited us to share their bread and tea and pipe. They might have managed between them to feed us without going hungry themselves, but in Iran the quantity or quality of the food has nothing to do with the offering of hospitality. I don't remember even one instance when a Persian failed to offer to share his meal with me, however miserable it may have been.

When the stream reached the mountain we left it and began to climb up the barren side of the highest peak. Dry rhubarb leaves were blowing about over the slope and I wondered if it had the large heavy roots that in Afghanistan we sometimes used for fuel and that burned with such a beautiful blue flame. The descent from the crest of the pass is long and gentle through a deep gulch that permits no view till it opens on the endless vista of the Great Desert, the Dasht Loot that stretches on for barren miles toward Afghanistan. The way all day had been over terrain harsh and bleak even for Iran and now in front of us in soft-hued haze lay the palms and orange groves of Chahar-farsakh, their flaunting fronds and sunsteeped foliage shielding the gaze from the awful sublimity of the infinite desert beyond. — We

stopped in one of the gardens where some other travellers with their camels and donkeys had halted and the soldiers went off to find some food. Then till dark we waited, watching the caravans that in the late afternoon poured steadily out of the gulch, hoping to see ours among them, or watching every speck on the desert for the foodbearing soldiers. At seven, Ali came along and at once set off to see what had happened to our foragers. The dear lad was office-bred and must have felt like doing almost anything but continuing his promenade into the desert. He didn't reappear, but sent rugs and a lantern, and we camped luxuriously under the orange trees in beds of petunias and gaillardias. We made a fire and chewed dates that we got from one of the camel drivers and waited. The soldiers didn't come back, but at eight our donkeys came tinkling down the mountain, by far the latest of the travellers. For all their hard day they were fresh enough and after a roll in the ashes of an old camp fire dashed off to graze in the garden. Food for us wasn't so easy to come by, so we ate cake and drank coffee and went to bed in the fresh breeze that slid off the mountain.

January 10. The gardens of Shahdad have high walls and the passage-ways between them are narrow. In the gardens date palms are planted at regular intervals and the remaining space is filled with a dense growth of citrus. Violets grow wild under the trees. There are a dozen varieties of citrus, most of them interesting and several such as I had never seen in other countries. The tangerines are of good flavor, sometimes with only traces of seeds and often with little rag. The sweetlime, the lime, the bitter orange, and the Valencia orange are good enough as such things go, but the most interesting things are of the lemon class. The *otroj* is a rough lemon, five inches long, with salmon-tinted flesh and a pleasant acid flavor, milder than a lemon. The *daba* is larger and smoother than the *otroj*, with a nice lemon flavor. The *bakh* is a grapefruit-like lemon, three to four inches in diameter. Then there is the common *limu khargi*, separable into segments, that we saw in the Kirman market. The dates are of a dozen varieties or so. The Shamsai and Basmuni which are of the best, are of a quality I had seen heretofore only in the much larger Piyaruni that I found at Hajiabad on the way to Kirman. These dates are not at all sticky outside and can thus be carried in the pocket like nuts. They are of good flavor and of the consistency of a caramel. Another dry date, orange yellow in color, with or without a developed seed, is strongly tannic and used mostly for cattle feed. It is supposed that the imperfect development of these fruits is due to some fault in fertilization. The fruit trees here all appear healthy. There are fewer dead palms than at Bandar Abbas, possibly because the ground water along the coast is nearer the surface. They say that dates thrive better still and give better fruit at Chaharfarsakh on the slope at the foot of the mountain where it freezes and snow falls. The people carry torches of dry date leaves at night.

Toward sunset a storm rose in the west and in its struggle to put out the dying sun, piled up battalions of black and ragged clouds that towered jinn-like into the sky. The sun shot volleys of arrows into the monster that pierced his writhing depths and deepened his inky wrath. Higher surged his awful mass. For a few brief moments Light and Darkness thus battled and then as the shafts fell faster, the apparition dimmed and faded, and the storm spirit swept in empty fury into the desert, leaving the sun to set in fiery glory among the tattered banners of the conquered foe. Desert storms often are such fantastic and fearsome visitations that pass in the gale and spitefully spill a tantalizing sip to the parched creation. More generous are the storms that arise from great low-pressure areas that move slowly and may refresh large stretches. In the Himalayas rains are often local and one may see the manufacture of the storm. A cloud wisp appears on the peak and floats forward, gathering volume so swiftly that it covers the sky as by magic and rain falls.

A big flock of goats came from the direction of the mountain at evening, tended by two boys. The shepherds are probably hired by the village goat owners and every morning assemble their charges and every evening bring them back. A young woman with a baby and a bleating kid came out on the plain to meet the herd, and when the kid's mother joined them, they went back again. I had never seen so many red goats in Iran before. In many desert places the goats are mostly black, though offhand it would seem that white would be a more suitable color in the heat. A flock of at least 50 ravens was busy feeding on the desert, but what the barren ground was yielding, I couldn't determine.

A man told us garlic was an excellent tonic for the eyes; Lahulis on the contrary positively know that garlic weakens the sight! Garlic is also considered beneficial for malaria in Iran, and Lahulis again have the opposite idea. Garlic here and in Lahul has at least the same odor and it is quite possible that it has no effect either on vision or malaria. Then too, Lahulis are apt to have something against everything on their meager bill of fare, except mutton and roast barley flour (*sattu*), but so, for that matter, are the Persians. It is unthinkable that a physician in either place shouldn't rigidly restrict the choice of diet of his patient. Two children told us it was a sin to kill a woodpecker and then were frightened at their temerity: we might take it as a reproof. The people whistle while the donkeys and horses drink — always the same sort of trilling whistle. Lahulis whistle while horses drink but don't bother for donkeys. The children here have their heads clipped except over the front one-third and the sun has often bleached to a queer red what hair they have. Those whose hair Time has bleached make theirs red too but with henna, which is a common plant in the warmer parts of the country. From India to Persia old age seems to be dreaded — something to be ashamed of in both

sexes. Where the Mongol gets respect for the fruits of his experience it seems his western neighbors get pity or contempt, and so even the commonest people seldom show white hair.

January 16. The weather looked hopeful this morning, so we got ready to leave Chaharfarsakh. By searching in the gardens here and at Shahdad we finally got a collection of seeds of most of the usual vegetables. Many things seem not to be generally planted so one finds peppers only in one garden and egg-plants in another, and nothing seems to be common but greens and what we call "herbs" and seldom plant. We got much help from a schoolboy, who, tempted by an American jackknife, ransacked the village with good effect, and every evening delivered his finds on a handsome blue donkey. There are several woodcock here in the orange groves. They say their name is *khoftu* and that they stay the year round, but that can hardly be. — As we entered the Dar, the gulch that leads to the pass, we shot a golden eagle that some ravens were teasing. As is often the case with birds of prey, even with apparently expert hunters like duckhawks, there was no trace of food in his digestive system. Golden eagles we have often found thus empty of food. From the fact that this eagle is one of the most widely distributed birds and in parts of Asia and America, at least, is a common bird of prey, it seems well adapted to survive and it may be it is abstemious by nature. In Afghanistan we used to take live chickens to the mountain tops to bait the eagles, but though they clearly saw the bait none ever attacked it. Other wild birds such as chukors and snowcocks I have often seen them chasing, once even a Great Bustard, but I never could be certain they ever caught one. On the other hand it seems at times they get rather hungry. An old female was brought me at Karaj one summer by a peasant who said the bird had struck at some pigeons and had hit the ground so forcibly that it couldn't rise again, and one dropped from the sky within a few feet of where I sat one day, attracted by the punch-bag we put up for our wild boar to exercise on. I have also frequently seen them sitting around or looking over carrion, though whether they ate it, I couldn't be sure. Smaller birds of prey like kestrels and also harriers I have usually found to be feeding regularly, but the game they look for is of course commoner and more easily got. — As we started climbing, snow began to fall, soft, thick flakes, and by the time I got to the top of the pass at one, everything was white. The ravens and crows had flown high last night, circled and dropped and sailed again and the natives said a storm was in the offing. The passage of the seasons alters little the face of the desert but the passing cloud has for a brief moment transfigured it, and I thought of the lines of Omar Khayyam:

> The worldly hope men set their hearts upon
> Turns ashes — or it prospers; and anon,
> Like snow upon the desert's dusky face
> Lighting a little hour or two — is gone.

Rup Chand and a Golden Eagle near Kirman. The Golden Eagle is at times a common bird of prey in Iran and Afghanistan, as it is in places in our own country. The largest of his tribe, he is also the most interesting and often puts on a spectacular act in the Desert's show.

A flock of fine donkeys reached the crest with me, carrying oranges to Kirman. I brushed off the wet snow that hung heavily on the uneven load and their master told me: "You'll get your hands cold." The descent was easy — in the slush and toward the retreating storm. The bare mountains black in the heavy light now looked wild and weird, and the pleasant little stream below stood out swollen and muddy. A scrubby tree growing out of a boulder along the way had numerous rags tied to it — just as one sees in the mountains from here to Tibet: one of the relict customs of an ancient culture which the religions of two milleniums have superseded but not effaced. In Tibet the rags are tied on with a prayer that the god of the region is besought to bring into fulfillment. Along the stream a sparrow hawk (*Accipiter nisus*) flew out of a bush with a red ball that looked like a pomegranate.

He had captured and plucked one of the little mountain partridges. — Toward four o'clock we arrived at Pushte, a lone house with a little orchard and a few fields, the only stopping place till five hours' journey ahead. Room had been made for us, but we were a considerable party and the house was small, so there was evident inconvenience for the lone woman who ran the place, and her assorted livestock. We seemed to have trespassed especially on the rights of a swarm of dapper particolored cockerels that till dark, rasped the air with their amateur crowing kept up beyond their habit by the intrusion. Our baggage had been stored in the oven where they generally spent the night. The hostess had taken refuge with a goat and a calf in the other room and wasn't disposed to have any traffic with her lodgers, not even to supplying us with a couple of the supernumerary roosters. At last, however, she consented to give two hens, and even to give two eggs with each hen, if we'd take them instead. This struck me as the height of imprudence, to kill hens in the beginning of the laying season when there was this obvious plethora of unprofitable males. The root of the difficulty seems to have been that hen meat is "warm" and cock meat "cold," or perhaps vice versa. Ali probably thought my insistence on roosters was motivated by these considerations instead of economic ones and finally triumphed, but he had to give a letter saying that he had requisitioned the birds. Probably the woman would be held accountable to someone for the shortage. In the fresh damp air today the whole route was perfumed and one came to understand what the old poets meant when they sang of the fragrant earth of Iran. Since then I have often noticed striking fragrances from freshly plowed fields, due probably to the broken roots of scented plants. The *Artemisia* or wormwood freshened by the rain gave off its bittersweet odor and at times on the slopes there was a strong smell like lemon verbena. In the valley along the stream some tall sugar-cane-like grasses were redolent of honey. I may have been a bit fanciful because Rup Chand said he had smelt nothing but the "old house" smell that you get around the tamarisks. — One of our donkey men has a job, from which he was temporarily released to go with us, that pays him 2 rials (6 cents) a day, and food. What the food consists of he didn't say, only that tea wasn't included, so he drinks water. The people in Kirman are generally poor, even judged by standards of a country where almost everyone is poor. Fuel is a luxury and is seldom used for heating houses: One tries to keep warm with clothes. Not everyone can manage to buy fuel even for cooking and food is commonly bought cooked, or for a small sum you can have your dish of stew cooked by the foodsellers in the bazar. One of the men thought Rup Chand would look younger if he'd wear one of their felt hats instead of his American straw one. I was a bit surprised at a suggestion of rejuvenating Rup Chand because he is usually taken to be fifteen years younger than he is and I fifteen years older.

January 20. Today is some kind of a holiday and the city is quiet as the grave. Accordingly I had Nikbur phone the mission hospital, which they said was run by Americans, to see if I might call. The hospital is on the other side of the city and it took an hour to walk there. Afterwards everyone wondered that I had found my way back. They say there are two horse-carriages in town that haul people about but neither crossed my path. I found a gentle kind woman in charge of the hospital, which turned out to be British and not American, exceptionally observing and intelligent, who of course liked the people. She said septic conditions were common, likewise deformed pelvises from rug weaving, that she had seen more hysteria here than ever she had seen at home. I had assumed that hysteria was an abnormal condition and that where every woman got a husband and therefore lived apparently more normally, neuroses might be less common. We generally feel sorry for the downtrodden females of the East but from what I have seen and heard, they rule the roost as effectively here as do their more enlightened sisters in the West, and the old girls are downright corkers. A young Persian woman has as wholesome a fear of her mother-in-law as she has of hellfire, and when I asked a friend once what was the trouble with her mother-in-law, she countered with "Do your girls like them?" Then I asked what sort of a life they had when there were a couple of wives in the house and was told the husband had to spend most of his time away from home if he wanted peace. The Persian woman impresses me as an intelligent, capable, and active creature. The man likewise intelligent, but more the dreamer, and easygoing. I thought I noticed about the same difference between the sexes in our South, and have read that but for their magnificent fire-eating spouses the men would have thrown up the Civil War much earlier. Certainly if I wanted to do something in Iran, I should prefer to have a band of women to work with than their husbands or their sons.

My friend said there was no foreign parcel post, except sample post, but that there was a reliable parcel post for the interior; that she thought I might find baking powder but dried milk she hadn't seen. She said there were so many beggars they were forced to go out with empty pockets so they could truthfully say they hadn't money. A teacher had told her that the children had fine memories but that it was difficult to make them reason. Since then I have spent two years at the government's agricultural high school and observed something of the educational system and its effects. I should have to say with the unknown teacher that logic wasn't the forte of the finished product of the Persian schools, but it seems I could understand that if a boy didn't learn to think it wasn't exactly his fault, since thinking is no more encouraged in school than, under the despotic government, outside it. Education in Iran, as in old Europe, is a stuffing of the memory, and agricultural instruction consisted in large part of memorizing scientific names of plants and animals, no matter from where, and

if the teacher chanced to know them, the English, French, and German names as well, of endless morphological and physiological terms of botany and zoology and whatever the other sciences could yield in the way of polysyllabic words, so that for weeks before the examinations the boys used to pace the avenues mumbling their jargon in preparation for the ordeal. And ordeal the examination was, a veritable academic trial by fire. The victim might be made to sit a day, or even two, outside the examiner's room waiting his turn before the Inquisition and then have his fate settled by a question, or maybe two, such as: "Name the breeds of French horses." One boy did especially well by being able to give the name of the elm tree in six languages and neither he nor I (I had had two year's experience by then) was surprised that he didn't recognize the tree itself as it grew in the avenues of the grounds. The fact that the names learned were sometimes partially or totally incorrect was a trifling matter because neither teacher nor student could believe that the correct scientific name of a Chinese plant or of the details of the digestive tract of some unknown insect had any bearing on Persian education, so the wrong one was no more irrelevant. Instead of showing the boys a cow's skull, the teacher described it; instead of letting them raise chickens, statistics were read on the status of French egg imports from Belgium, so it isn't strange you could find graduates who couldn't tell wheat from barley, nor a peach tree from a willow, nor was it an idiot either who having watched me dip water from the stream and put out the fire, asked if the liquid had been gasoline. Let no one suppose from the foregoing that the Persians are feeble-minded. I should rather say that they are mentally as agile as any people I have ever been among. Certainly for learning languages they have the extraordinary aptitude one often finds also among the Indians. One boy who came to me for English lessons after school could with ease carry on a conversation in that language at the end of eight months and had read with me all the reading material prescribed in the seven years of English instruction in the schools. Another student who studied German mostly by himself could converse with reasonable fluency after four months. And coupled with this remarkable ability one finds a keen appreciation of literary beauties but rarely met with among us. The amount of poetry most Persian boys know is colossal. A common way of killing time is a game called *moshaireh.* One boy quotes a line of poetry and the next has to quote one in return beginning with the letter that ended the previous quotation. Such a game would soon be finished in the most intellectual group we could collect in the United States, but the agricultural school boys had sessions that lasted through the afternoon without any of the competitors falling out.

The Persian peasant, on the other hand, never goes to school and is by no means mentally constipated. He has to use his wits to wrest a living from a parsimonious Providence and a conservative landlord. He has observed and profited by his observations. He has seen that

only certain lateral shoots of the muskmelon vine bear fruit well and he will show you on the growth rings of a stump that young trees need three years to establish their roots. The Karaj peasants, though my fame as a foreign specialist in agriculture was bruited abroad, didn't rush for advice till they saw results that they hadn't expected, and their discussion of world politics had more sound sense than an armful of *Reader's Digests*. I often recall a conversation I once had with a Georgia cracker. I expressed my surprise at the originality and soundness of his views and he replied: "You see, we can't read. We have to think things out for ourselves!" — My sojourn in Iran was prolonged always in the stimulating hope that I might be able to get some government interested in letting me try to do something for a people so worthy of a decent life. No Persian ever believed that I or anyone else would be successful in arousing such an interest in any government, and were equally unanimous in blaming the blocking of all progress in the country on the British. The Germans, they said, had repeatedly made proposals for economic improvement, and foreign pressure had always effected their rejection. The strong pro-German sentiment in the country may have had its roots in such beliefs as this.

On the way home someone hailed me in the half-lighted street and I found one of the young military officers who had come up with us from Bandar Abbas. He had had perhaps a glass too much and we hugged each other and exchanged vows of friendship. — The men were bargaining today for a piece of cloth, fine handloom stuff of cotton warp and cashmere weft, such as one seldom finds nowadays since there are weaving factories that reproduce foreign designs. They were ready to pay 65 rials against the asked-for 80 when a beggar gave them a wink and they got it for 60. Ali said that was the right price and that the beggar added to his income by such hints to prospective buyers.

Children and youths here often have the whole side of the cheek a bright red, but for some reason they fade soon. The men gave the housekeeper's little girl some candy and her father came with a slab of bread. They gave some to Nikbur who had wanted to bring us all supper from his own home the night we came back from Shahdad, a hospitality he could probably afford less than I could giving away an automobile, and he brought a plate of nice red apples. The aforementioned candy was enclosed in a sack made from an old rug pattern, a bright thing that I cut up and enclosed in letters to friends at home. Wangyel was met with hard scepticism when he described the potatoes in his country and not till he cut the size to no more than twice that of the runts one sees here was it allowed likely.

January 24. We expected to leave Kirman for Jiroft today and got ready. Nikbur took home such things as we wouldn't need on the trip and at 3:30 they took our luggage to the bus station and weighed it.

We had been warned the bus would start at 4:00. Nikbur wanted terribly to go along with us because officials get a little travelling allowance, but the job fell to a youngster named Zand who had seemingly never undertaken such an adventure before. His friends came in hordes to bid him goodbye and the garage courtyard showed scenes like those before the gangplank of an ocean-liner, but still the bus didn't start and eventually the cold emptied the courtyard of all but the passengers. The last to go was one of Zand's relatives, a boy of 16 with the usual nice Kirmani smile. He knew some English and was delighted to talk in public in that language. We got off at six, well loaded with human cargo. We were given the "best" seats, behind the driver, but there were sacks on the floor so that my knees were wrapped around my ears. Outside the city we stopped for the customary police inspection, and for an hour the passengers had their passes registered by a nice-looking youth who did his job pleasantly. We didn't have any passes but there had been a telephone call about us. A lot more people got aboard at the police station, but I was too weary to see where they could possibly stow them, and a little farther on we picked up a couple more who hadn't passes and therefore were put to the inconvenience of walking past the police post. At 8:30 we got to Mahun and stopped for supper. They said we could have anything we wanted to eat which is the usual way of saying tea, bread, and eggs. An hour later we piled back into the bus and drove a bit to pick up one of the passengers who had gone to someone's house. He came out and said he hadn't eaten yet, might he eat. In 15 minutes he came and we started.

There is a famous old mosque in Mahun, the turquoise dome of which shone in the moonlight, the first impressive building I had seen since the Moghul remains of India. The road soon ran through a snowy landscape with low ridges on either side. At three we stopped somewhere for tea, about the first building since Mahun. There wasn't any place to wait except in the crowded "coffee house," as these places are called for some reason (Persians seldom serve coffee except at wakes), so we crawled back on our seats in the bus and crouched there benumbed till the driver came to start at half past five. We got to Bam sometime after sunrise, too stupified even to be bad-tempered. This was our first ride on the public buses, smart-looking light-blue glassed-in things that gave no clue from their appearance to what agony one might endure from a ride in them. I could never get any other reason for riding through the night than that it was too warm for the cars in the daytime. More enlightened comment suggested that since camel caravans had always set out at evening, folks had come to like night travel. With trifling added inconveniences such as derive from association with carsick or lousy neighbors, this trip was a sample of our travel in these vehicles while we were in Iran. One wonders perhaps that I don't mention quarrels and bloodshed, but the Persian is singularly patient and tolerant, and almost never

anything but courteous, and it seems as far as is possible he disregards his own discomfort, perhaps since he doesn't have to look far to see someone obviously less comfortable than he. They said folks at Bam suffer much from malaria which they get from eating so many dates. At Bandar Abbas they also knew that the disease was contracted from date-eating and that such a diet made the complexion dark. I had heard in India that malaria may result in a deepening of the skin color and it may be that the swarthier complexion of the older Persians is due to malaria. It may be mentioned that the cause of malaria is ascribed in different places, to different things such as spring water, stagnant water, grapes, cucumbers, etc., and I don't remember ever hearing the right cause mentioned. Even at the Agriculture school at Karaj where solemn lectures were given the students on health, the mosquito-wrigglers waxed in the pools and the doctor's assistant, who had his house carefully screened except for a hole that a dog could have gone through, slept outside without a mosquito net.

The Shrine at Mahun. There are countless shrines ***(Imamzadeh)*** throughout the country in varying degrees of size and sanctity depending on the repute of the person whose remains they house. A few cities have superlative structures and the great mosques of Qom, Isfahan and Meshed might well draw to worship gentle people of any faith.

Persians have very mobile faces, and like us their mask is stiff and repelling. Tibetans, on the other hand, can make their faces such a blank that you are as unaffected by them as by a statue.

January 30. Deh Bakri is in the foothills of the great Jamal Bariz range that forms part of the southern rim of the Great Desert, the Dasht Loot that runs for more than 500 miles to the north. We have come on foot from the date plantations of Bam to visit the more important and more extensive ones across the mountains in the Jiroft district that stretches off southward to the ocean. People here commonly wear for shoes a big piece of wood tied on with a string. One man has cloth *giveh* like mine but he has reinforced the sole with a piece of heavy sheet-iron. He said he couldn't be buying new shoes all the time. A nice purple *Colchicum* is blooming in the fields. One garden has a most attractive almond tree, much like our yellow birch, which they said had bitter nuts.

We arrived here day before yesterday in the rain that was heralded by a gale so tremendous that walking was difficult. The rain kept on for 36 hours and we have been sheltered in the one-room telephone office, apparently the finest building in the village. It required a skillful comprehension of space relations to find room for everyone to stretch out his length at night among the piles of luggage, but sleep was another matter. The mud roof, softened by the rain, began flowing in trickles through the reeds that formed the ceiling and then dripped capriciously here and there over the helpless human carpeting. Three huge cats frolicked and yowled over belly and face till even the Persians lost patience a couple of times and chased them out through the windowless apertures. During the day there was no peace either. From time to time someone came to telephone and made his way to the instrument by stepping over us with an "Excuse me" apiece, as we sat huddled in the mud on the floor. For a few minutes he would shout at his distant auditor who seemed not to be giving full attention and constantly was admonished to "look" and "listen." After a brief interval of calm the whole thing would be repeated. Apparently they only wanted to see if the line was working and thought it would be impolite to let it go at that. There are times in this part of the world when a simple "How do you do" won't do for a greeting. In Afghanistan the salutatory ritual was perhaps the most complicated. Both parties began the recitation simultaneously and among certain peoples, accompanied it by a series of embraces. The performance is hardly less original than our handshake and exchange of trite remarks and has the advantage of having a prescribed and predictable end.

Our poor camel had to sit outdoors in all the rain because the doors of none of the buildings are over five feet high. He was heavily blanketed but nevertheless complained dismally to anyone who approached. Camels are said to be very intelligent. Their haughty bearing and measured gait would bear this out and I was always

favorably impressed by the air of disdain with which they regard humanity. I am told if you load them too heavily they won't get up and it is dangerous to mistreat them — they keep it in mind. Their incredible hardiness and their uncanny skill in finding their way through trackless wastes are proverbial. I learned here that in places they are stimulated on hard journeys by tobacco smoking. People have also told me of tamed sparrows, foxes, pigeons, and other animals that became tobacco or opium addicts and came regularly at smoking time. When there is a particularly long waterless stretch ahead the drivers inform the camels at watering time by a special song so they will drink more heavily. The Tibetans have a special song they sing to their sheep while loading them to remind them there's a hard day's work ahead. The plowing cattle are also encouraged with a song that urges them to make just one more round and calls them pleasant names like "drinker of the snow water" and "eater of the lovely flowers." Unlike the noble horses, the camel isn't greedy. A caravan of these great animals kneeling shoulder to shoulder around their meal of shredded herbage, served on a cloth like their master's *sufreh* and munching in dignified silence gives a chastening air to the camp, and whether from association with their magnificent beasts or from their life in the solitude of the desert, the camel drivers are a manlier group of human beings, simple creatures with more sense of human dignity. The tree of the windswept plain takes a different form from that of the sheltered forest.

I found three magpies dead, apparently of exposure, under a tree. The other magpies seemed none the worse for the protracted rain. At Karaj I occasionally found corpses of magpies, that seemed to have died of intestinal troubles. Other birds were seldom found to have died except through violence.

We started on our way through the long stretch of broken ground that separates us from the coastal plain. For most of the day the road ran through rocky ravines rather densely grown up to scrubby trees and bushes of wild pista (*beneh*), maple, and almond. In places there were large and very dense trees of *beneh* and in them for the first time we found a curious grosbeak (*Coccothraustes coccothraustes*). Goldfinches and chickadees were common; there was one blackbird (*Turdus merula*) and a flock of serins (*Serinus pusillus*); and we collected a golden eagle ready to lay. Since our stage today was to be only twelve miles, we didn't take much lunch, but when at half past three we arrived at Maskun, the rendezvous, no one was there. Luckily we met a traveller who said our things had gone on to Mohamedabad; so on we went in pursuit. Mohamedabad is off the road and we passed it without knowing it, but no matter, since the next person we met said our caravan was still on the march. His neighbor joined him now and urged us to stop and rest a bit while he made tea for us and he'd find out something definite about the travellers ahead. A man

Mountain Forest near Deh Bakri in Kirman. The higher mountains of the great Iran Plateau have or had forests of oak, and more rarely juniper, growths that may properly be called trees. In much of the country the "forests" will be such growths as this, of almonds of several sorts, cherry, maple and pista (wild pistacchio). There is always game in such places, partridges and pigs the commonest.

came just then and said that they had made camp at a settlement three miles farther on. It was now five o'clock and near sundown and it was always possible that the distance might be more than three miles, so we sent Wangyel on to find them. Our host sent a man to accompany him and to bring back our bed. Us he took into his dugout – he had three in a row; he had two wives, he said – and got out his lantern. One of the wives was told to get ready bread of the best white flour, to make tea, to kill a chicken. This last was a remarkable order since Muslims in these parts don't kill things after sundown, but we saved the chicken's life. We had shot two partridges on the way and these we roasted over the charcoal – a popular form of preparing meat in Iran and called *kabob*. Our host's brother and son and a couple of neighbors sat with us. The boy was a nice lad of about 15 but for some reason they insisted he was 12. It seems the official

birth records are somewhat lax and in the identification cards that every male has to carry the recorded age is, for one reason or another, likely to be incorrect. Many don't know their age or their birthday, and many have registered themselves as older or as younger, probably with an eye to the compulsory military service law. The boy had just shot into a flock of partridges with an ancient homemade shotgun, but without effect. I remarked that if he'd got a bird with his shot we'd have had a nice meal. The uncle observed if he had got two, it would have been still nicer. I said how nice that they had so much wood, and they answered that that was about all they did have. To approach the partridges the boy used a screen made of a sheet on which were painted in various colors, dots, bars, and other figures. Such screens are used from here to the Himalayas to delude the chicken tribe that seem especially fascinated by strange sights. Himalayan hunters often use leopard skins for the purpose. We tried such screens on the great bustard, cranes, and other wary birds but they only fled the sooner. The boy brought out his geography book and took a look at the map of the United States; what did we buy from Persia; what was the news of the war? Tibetans always like to have war news too. When the bed came, we went out and slept in the alfalfa field, to our host's dismay. They had sent a sack of candy with the bedding and this we divided among the small crowd that had collected to help put us to bed. The man who had brought the bedding got the biggest share but he promptly distributed what he got among the poorer lookers-on. There are apple trees here three feet through and peach- and apricot-trees to two feet. Usually apple trees and peach trees hardly get larger than posts in the desert regions we have visited. They have a huskless barley (*jau khilu*) that looks like wheat; it isn't glutinous enough for good bread, they say.

February 3. Tomagaon lies several miles beyond the foothills at the edge of the great plain in a landscape that is reminiscent of the Punjab. Half of the fields are planted to grain now beginning to head, and the rest are fallow. Apparently there is plenty of water for irrigation. Outside the fields are large patches of grass and tamarisk bushes. A few miles below there is a "jungle," all of grass and bushes, where fires are burning here and there. The word jungle is Persian is origin and here or in India does not mean necessarily a dense forest, as has come to be its signification with us. In fact, outside of the narrow Caspian coast strip, Iran has no forests worthy of the name. In India, the term may be applied to a stretch of wild grass without necessarily a tree or bush in it, while Persians call such places *besheh.* Across the river to the west in the desert are patches of green – villages lying in palm and orange groves. Those nearest the mountain have best citrus, they say, while Dusari, 6 farsakhs below, is recommended for its dates.

The houses here are mostly built of cattails on stick frames. Last

night when we arrived we camped under a large *Zizyphus* tree in which the birds were busily eating the fruit and raining down on us the pits. But a thunderstorm came over the mountain below and looked so

Reed houses in Tomogaon, Kirman. The people of these parts make shelters of grasses of one sort and the other that grow abundantly in the undrained parts of Jiroft. The air circulates through the walls and they can be cooled by water. The strangers have just arrived and the populace has not yet collected to admire their funny things. Some one will move out to give them his house.

threatening that we carried our things into a house. It had early been cleared for us of all inhabitants except two hens and their chicks. The mothers were distrustful of the foreign infidels and until we put out the lantern croaked and squawked alarms to their unconcerned and drowsy family.

We paid up the horsemen but they decided they might as well take us back to Bam; so we engaged to board the donkeys till the return journey begins. They can graze during the day on the edges of the fields and in the desert and at evening we'll give them some grain and some grass to keep them occupied through the night. Cattle have to be brought in at night everywhere on account of the wolves and leopards.

The collection of seeds went on briskly all day. Such an enterprising lot as these villagers we hadn't seen in a long while. They ransacked their fields and their houses to get what we wanted and even found a few wild cucumbers (they call them devil's cucumber *"khiyar shaitan"*), that have long since been out of season. These wild cucumbers are the size and shape of an egg and keep well, but seem to be eaten by wild animals, probably for their seeds, since the flesh is bitter. Edible sorts, of the size and shape of a football, that are cultivated in parts of southern India, keep for months hung up in the house. India has many varieties of cucumber; another remarkable one doesn't run like the rest of its tribe but stays bushy. Egg-plant, cucumber, carrot, squash, and onion seeds have been rare; leek and pepper have not yet appeared. There is a curious long white and purple turnip as long as an icicle radish, the like of which I had never seen anywhere. The foliage even is different from that of orthodox turnips. Peas we find for the first time in Iran.

Birds, as birds in desert places go, are common. On the river are some waterfowl and the grainfields provide forage for many others. The fields are especially the haunts of two kinds of partridge: *Francolinus pondicerianus* called *karmanzil*; and *F. francolinus*, or *toraj.* The former sings in the morning from 6:15 to 6:30; the latter from 6:30 to 8:00. Without a dog they can't be flushed from the grain and outside the grainfields they are very shy. Our host — a nice boy — said he could get them for us, but we didn't take the promise seriously since they wouldn't dare use guns in front of our soldier-escort, and even if they had firearms they would hardly be equipped for partridge hunting. In India these birds are often netted, but here folks had a different way of hunting. They got them with sticks! In the evening they brought eight. A crowd of men and boys having flushed the bird hurl their sticks at it and if they miss they rush to the spot where it alighted and try again. The price we paid for the birds was so tempting that a protesting hen was brought afterwards with the assurance that she too was a *karmanzil.*

The ladies of the community gathered to watch us eat breakfast and then one asked for a taste of the funny-looking cake. A good Musalman would never think of eating anything a Kafir cooked. There might be a dozen reasons why it would be unclean, none of them of course having the remotest connection with actual cleanliness. A Hindu goes the Musalman one better — he not only won't eat anything an unbeliever touches, but what's more, not what lower castes of believers touch, and I am told the matter has been carried to its logical conclusion by one sect. Its members eat nothing that anyone touches — each member of the family does his own cooking.

A bee-eater is boring a hole in the wall of one of the few mud houses. I wonder if he will make his nest before he bores through.

Some of the women in the mountain above here blacken their teeth with something they call *"ahmen"* and here to enliven their tea they add a mint called *"alale"* or *"aglale."* — A goat got caught in the thorns of a wild zizyphus bush and the shepherd found him by the crowd of vultures and a golden eagle that had assembled for the end. There seems to be only one cat here, but dogs are plentiful. One poor puppy got a lot of beatings for trying to steal his living; so Rinchen Gialtsen has been feeding him and the yelping has stopped.

The women all appear to be pregnant and most of the birds seem to be breeding: duck hawk, barn swallow, shrike (*Lanius lahtora*), dove (*Streptopelia decaocto*), pipit (*Anthus decaptus*), etc. The women spin cashmere thread very fine (I never saw such skillful spinners anywhere) and they weave beautiful cloth from it. Its width is only about six inches, I don't know what they can make of it. The goats here seem to have heavy loads of "cashmere" under their hair; they say a goat may yield as much as two pounds. Tibetan goats have a much scantier growth and probably a dozen wouldn't yield two pounds.

The Governor at Sabzwarun sent a stone jug with about ten pounds of Murdasing dates preserved in date syrup, each fruit separate and sugary, something quite new and nonpareil in the date line. The date syrup, or *shireh*, is in itself a most delicious thing, though it is but little known outside of the date-growing regions. When the date bunches are cut and hung up to dry, the juice that drips from them is collected and made into *shireh*. Grape *shireh* made by boiling down grape juice is found everywhere, but always has a cream of tartar tang that limits its usefulness as a sweetener. The earliest ripening date, they say, is the Alimeteri that ripens about the first of July; the latest the Halili, in September.

At night a little boy came with a *karmanzil*. He could hardly contain his joy at the prospect of the twenty-five cent reward he would get. He had caught the bird himself and probably was getting the first money he ever had, and such a lot of it too. There are a few pairs of mongoose about camp but they never come near. In India they sometimes came into the tent after meat, and at one place in the Himalayan foothills a pair stayed with us and came regularly for the discarded birdmeat of the taxidermy operations. An enormous lizard was likewise attracted by the meat and took up his quarters in a hole nearby. He came to blows with the mongooses one day and for a few minutes there was a bit of an uproar, but the encounter didn't excite him enough to disturb for long the nap he was taking at the mouth of the hole when the trouble began. I had expected from what I remember of the Jungle Book that a mongoose would make short work of anything in the reptile line. It is said there are in the mountains two kinds of wild grapes with large berries. I had noticed vines with huge trunks in the ravines on our way down.

(To be continued)

PERSONAL RECOLLECTIONS AND MILITARY RECORD OF COLONEL VALERY HAVARD, MEDICAL CORPS, U.S. ARMY

Fairfield, Connecticut
October 15, 1924

The Librarian, Army Medical Library

Sir,

In compliance with Circular Letter No. 20, S.G.O., April 15, 1924, I respectfully submit the following record of my life and services as medical officer in the U.S. Army [1].

I was born in Compiegne, "Departement" of Oise, France, February 18, 1846. My father (Louis Stanislaus) and mother (Eugenie Prudence), as well as most of my ancestors, so far as known, were also native of the same province (Ile de France). Of my three sisters two are still living (1924).

Most of my early education was received in the Ecole Normale and later the Institut Agricole of Beauvais, Oise; I graduated from the latter establishment in 1865.

In October, 1865, I left France and came to New York, having been offered a position on the staff of Manhattan College, New York. Realizing in due time that the practice of medicine offered me the best chance of success, under my circumstances, I matriculated in the University Medical College of New York, receiving the degree of M.D. in 1869, and entering, as intern, the Childrens Hospital on Wards Island and later on Randalls Island. This same year I received the degree of M.S. from Manhattan College.

In July 1869 I was called to San Francisco, California, by an old friend, Felix Demesmay Templeure, of Nord, France, who was then engaged in the business of exporting wheat to France and who had induced me to join him in it. But the outbreak of the Franco-Prussian War broke up these arrangements. My friend returned at once to France. I became a professor in St. Mary's College, and at the same time, began the practice of medicine.

[1] Colonel Havard's account is published with the kind permission of his son, Captain Valery Havard, U.S.N., of Arlington, Virginia. With the consent of Captain Havard we have also added certain supplementary information. Some years ago the junior editor of the Asa Gray Bulletin, in the course of work in the United States National Archives in Washington, D.C., made a series of notes pertaining to the career of Valery Havard the elder, with the intention of expanding these and incorporating them into a paper on the work of this important early botanist. The preparation of such a separate paper has been indefinitely deferred by pressure of other work, but dates and certain other information and annotations have been supplied in the following pages. These editorial additions are in italic type, and are included in square brackets; the data are from the National Archives, or from other sources as noted. Appendices I and II have likewise been supplied by the junior editor. — R. McV.

In June, 1871, desirous to see something of the Great American Desert and its Indian inhabitants, I accepted a contract [*dated at San Francisco, May 26, 1871*] for service as Acting Assistant Surgeon, U. S. Army. I left San Francisco in July under orders to Camp McDowell, Arizona, and proceeded by steamer to San Diego and thence by stage to Fort Yuma, Arizona. From this point I traveled by ambulance on the Gila River road, with a detachment of soldiers. At Maricopa Wells [*July 4*], we turned north across the Gila, and further on across its affluent, Salt River, near Phoenix (then consisting chiefly of a flour mill), reaching Camp McDowell on the Rio Verde, the same day [*July 6*]. A week later I went out on my first field service against Indians. They were not very dangerous and seldom attacked white people, but frequently robbed the post of supplies left unguarded, especially canvas sheeting off haystacks, an article of great necessity to their comfort. We pursued them as far as the Tonto Basin but without success.

Transferred in November, 1871, to Camp Grant [*left Camp McDowell Nov. 14; arrived Camp Grant Nov. 18*], on the Rio San Pedro, then the reservation of several Apache tribes, and a short time previously the scene of a terrible Indian massacre by a party of white men from Tucson. In May, 1872, General O. O. Howard, as special inspector, reviewed the Indian agency and camps, and in the presence of delegations from civil authorities, settlers, Pimos and Papagos, endeavored to establish durable peace relations between the citizens and Indians of Arizona. About 800 Indians drawing rations at the agency and receiving medical care from the post surgeon. Post abandoned in 1873.

Transferred to Camp Hualpai, in beautiful hilly country, between Prescott and the Colorado River [*Left Camp Grant March 20, 1873 arrived Camp Hualpai March 29, 1873*].

Arizona Indians, in those days, unless fed by the Government were often hard pressed for food. The Cactus Family supplied them with some edible fruits, especially the Giant Cactus (*Cereus giganteus*), the largest representative of the family and the most curious tree of the American Desert, imparting a very singular and lonely aspect to its barren hills. The straight shaft, armed with formidable thorns, is often 40 or 50 feet high, and from it spring a verticil of a few branches parallel with it. At the apex are borne gorgeous flowers succeeded by succulent fruit. Several species of *Opuntia* were likewise utilized, less desired but much more easily obtained. The Amaryllis Family also furnished highly nutritive species of Agave (*A. Palmeri* and *A. Parryi*), the Mescal plants of the Apaches, prepared by trimming the leaves and baking the "head" in a heated pit.

Realizing the danger of professional stagnation in my situation, and desiring to devote more time to the extension of my medical

studies, I resigned in July, 1873, and returned to San Francisco by stage and Army ambulance, by way of San Bernardino and Los Angeles, connecting with the terminus of the Southern Pacific at Bakersfield [*left Camp Hualpai July 14, 1873*].

I may note that the possibly dangerous effects of the high and dry temperature of Arizona and southern California can, with ordinary care, be readily guarded against, so as to avoid sunstrokes and other dangers to health. Twice I suffered in that climate from serious isolation, contracted by unnecessary and prolonged exposure to a temperature exceeding 100° F. The first time, while at Fort Yuma, taking a foot ramble through the town (across the river), with intense light and heat reflected from the sandy soil and the whitewashed buildings, I incurred a severe attack of vertigo, which compelled me to remain several days in a tub of cold water. The second time, while I was travelling by stage across the valley of the Colorado, on the San Bernardino road, the driver allowed his thirsty horses to drink freely from a cold spring. One of the animals became foundered. I offered to go to the next station and send another horse. After walking a few miles on the desert road, feeling tired and overheated, I sat in the shade of a large bush. A singular noise soon attracted my attention, namely a quick succession of sharp clicks in regular rhythm, each two clicks followed by a brief interval. They seemed to be loud enough to proceed from a distance of at least a few hundred yards. I thought at first of an Indian encampment. I listened and searched the bushes round about with wondering eyes, but without any explanation of the mysterious noise, until, placing a hand over my left side I quickly realized to my great astonishment, that the clicks in question were nothing else than the greatly strained and exaggerated beats of the heart. Fortunately the station was quite near by. Here an Army ambulance, drawn by four spirited mules, offered me a seat, so that after a suitable rest I was able to continue my trip with great comfort.

Left San Francisco early in August, 1873, and later in the same month sailed from New York to France, spending most of my time while in Europe in the hospitals of Paris.

Returned to New York in January, 1874 and in September successfully passed my examination for admission to the Army Medical Corps. In October I was assigned to Fort Pembina, N. D., on the Red River of the North, and the boundary line between North Dakota, Minnesota, and Manitoba. The navigation being closed on the Red River I proceeded by stage from Fargo, N. D. [*Arrived Ft. Pembina Oct. 26*]. Fort Pembina has the record of being the coldest military post in the United States, the thermometer falling to -48° my first winter, and the ice on the river reaching five feet in thickness. During my stay, very pleasant relations were maintained with British

civil and military authorities of Manitoba, as well as the halfbreed population of the neighborhood. In summer steamboats plied on the Red River between Fargo and Winnipeg. The temperature then not infrequently reached and even exceeded 100°F. Mosquitoes, for at least six weeks of June and July, become so numerous and voracious as to constitute a plague. In that period, masks and gloves are necessary, and cattle have to be protected by smoke fires. In winter, the river offers excellent sleighing, provided the air holes (always left by nature) are carefully marked with bundles of brush. It is seen from the above figures that the range of temperature throughout the year in this section of North Dakota, Minnesota, and Manitoba is about 148°F., probably as great as in any part of North America.

On the Red River the timber is mostly oak, ash, elm, aspen and box-elder. On the James River, further west, it is mostly elm and box-elder. No cottonwood grows on either of these streams.

Wishing to acquire experience with troops in the field I made application, in 1876, for duty with Gen. Custer's command but was informed that all assignments had been made. Dr. Lord, the medical officer selected, was one of the victims of that tragic campaign.

In 1877 I renewed my application for field duty and, in May, was assigned to Gen. S. D. Sturgis' command (7th Cav.) at Fort Lincoln, N. D., and thence, through the summer and fall took part in various expeditions, part of the time in union with Gen. Miles on the Upper Missouri and the Yellowstone. Having been informed of the advance of the Nez Percé Indians (about 500, including women and children, under Chief Joseph), through the National Park, Gen. Sturgis turned south into Wyoming and after crossing the Stinking Water River, into the National Park, so as to intercept them; but they eluded us, passing undetected on our right flank, not only the Indians but also the command of Gen. Howard in pursuit of them. We overtook this command on Clark's Fork and took its place in the immediate rear of the Indians, coming in contact with them the next day a few miles north of the Yellowstone. A sharp skirmish ensued, a few men being killed and wounded on both sides, but the enemy could not be stopped. Gen. Miles being advised of our failure, speedily led his command from Fort Keogh, Tongue River, northwest to the trail of the Nez Percés and inasmuch as the latter had not been permitted to pass the frontier and enter the Canadian territory, they were compelled to surrender. Returned to Fort Lincoln in November, with battalion of 7th Cav. and some infantry.

[*Havard left Fort Pembina April 12, 1877, and reached his new post at Fort Lincoln (then commonly called Fort Abraham Lincoln), near Bismarck, on April 18. From May 2 to November 19 he was on field duty on the upper Missouri and Yellowstone rivers, with the 7th Cavalry, under command of Col. S. D. Sturgis. A detailed diary of*

the movements of this command, together with Havard's account of the botany of the country traversed, may be found in Appendix QQ, House Exec. Doc. 1, pt. 2, vol. II, 45th Congress, 3rd Session (Ann. Rept. Chief Engineers, U.S.A. 1878: 1672 - 1687. 1878). The first part of this appendix, pages 1672 - 1680, comprises Lt. L. R. Hare's report of the march itself. Pages 1681 - 1687 are occupied with Havard's "Botanical outlines of the country marched over by the seventh United States Cavalry, during the summer of 1877". Havard later published an expanded and more comprehensive account of the botany of the Upper Missouri, combining data from his trips of 1877 and 1879 (see below). The troops in 1877 actually spent most of the summer in the valley of the Yellowstone, which was ascended from the mouth to near the headwaters of Clarks Fork, in northwestern Wyoming (dates in Wyoming, September 4-10); after this they crossed to the Missouri near the Little Rocky Mountains in present Phillips Co., Montana, and descended the Missouri to Ft. Buford, 4 miles below the mouth of the Yellowstone. Havard reached Ft. Buford on November 10, and Fort Lincoln November 19].

Left Fort Lincoln on leave of absence March [*27*], 1878, reaching Paris in [*late*] April. Then, in the company of my friend, Capt. Henry Nowlan, U.S.A., travelled through France, Italy and Switzerland. Returned to New York in September [*Sept. 11*]. The scenes of these travels, although very instructive and thoroughly enjoyed, would be deemed out of place in this more or less official record and are therefore omitted from it.

In October, reported to Headquarters Department of the South, in Cincinnati, and was assigned to post at Chattanooga. Yellow fever had been prevailing in this town and the garrison was still camped on Missionary Ridge when I arrived [*Oct. 26, 1878*]. In November no new case having appeared, the command returned to its barracks in town.

In April, 1879, the Chattanooga post was abandoned and I was directed to proceed with the command to the site of the future Fort Assiniboine on the Upper Missouri [*Left Chattanooga Apr. 12, 1879; arrived Bismarck, D.T., Apr. 17, 1879*]. The entire regiment (18th Infantry), having united at Bismarck, embarked on three steamers and proceeded up the Missouri, the navigation being slow and rendered difficult by sand-bars and rapids which, several times, compelled the troops to land and march past them. The Indians were said to be restless and leaving the reservations but gave us no serious trouble. Passed Fort Buford, near mouth of the Yellowstone [*April 24*].

Arrived at Coal Banks[2], early in May [*May 4*], where the regiment was landed and marched to site of the new post (Fort Assiniboine) north of the Bear Paw Mountains. Soon after I accompanied a scouting expedition to Fort Belknap, the Indian agent there being apprehensive of an attack. Sitting Bull was then on Black Creek (35 miles north) with 800 lodges.

Visited Fort Benton, a small, uninteresting military post, and near it a rather shabby settlement, paved with cast-off playing cards, a revelation of the chief business of the settlers. About 40 miles to the southwest are the Falls of the Missouri where now stands the prosperous town of Great Falls. At that time the only habitation in sight between the two places was a cattle ranch, the falls forming a wild and lonely scene hidden below the surface of the level prairie. As an ornament to this scene were noted, on the declivity of the banks, several clumps of the two varieties of poplar (Populus balsamifera), namely vars. *candicans* and *augustifolia*; they take the place of the cottonwood which disappeared before reaching this altitude. Here were also some box-elder and red cedar, as well as shrubs like choke cherry, prickly gooseberry and rosebush. No pine was seen on the banks nor on the grassy plains above.

In June, 1879, I returned East by the Missouri to Bismarck, thence by rail to Duluth, and again by steamer to Detroit. Lastly by rail to Columbus and Cincinnati where I reported to Department Headquarters. Assigned to Fort Johnson, N.C., picturesque little post at mouth of Cape Fear River, reached by way of Chattanooga, Atlanta and Wilmington, an ideal locality for sailing, fishing and botanizing, in peacetime, but with little opportunity for anything else. Relieved from duty at Fort Johnson in June, 1880 [*left June 14*], and ordered to New York for professional examination for promotion.

[*There are numerous references to Havard's spring trip of 1879 in his second paper on the flora of the upper Missouri River basin; this is in Appendix SS, House Exec.Doc. 1, pt. 2, vol.II, 46th Congress, 3rd Session (Ann.Rep. Chief Engineers, U.S.A. 1880: 2513 - 2530. 1880). His paper is entitled "List of plants found on the plains of western Dakota and eastern Montana during the summer of 1877 and spring of 1879", and is intended to incorporate most of the information contained in his earlier "Botanical Outlines" of 1878. In the spring of 1879, with a detachment of the 18th Infantry, he left Bismarck about April 18 and reached the point of debarkation, Coal Banks, about May 4. Apparently he went directly to Fort Assiniboine and remained near there, except for his trip to Fort Belknap, until*

[2] Coal Banks, never a permanent settlement, and long since vanished from maps, appears on the Army Engineers' Map of Montana, 1 inch = 12 miles, 4th and 5th editions, 1881. This was about 30 miles northeast of Fort Benton, at the northernmost bend of the Missouri River, just west of the 110th Meridian, and the nearest point on the river to Fort Assiniboine.

May 28, when he left for Fort Benton and the falls of the Missouri. He was in the vicinity of the falls on May 29 and 30, and at Coal Banks on the 31st, presumably to take the steamer to Bismarck. He was in Cincinnati, Ohio, June 19, and reached Fort Johnston, at Smithville, North Carolina, June 27].

Assigned to Department of Texas, reaching Headquarters at San Antonio, by way of Key West and Galveston, in August, 1880. Soon after I was directed to report to Colonel W.R. Shafter whose regiment (1st Infantry) was under orders to Presidio del Norte and Fort Davis (later, in 1898, in command of the division which invaded and compelled the surrender of Cuba). The Rio Grande, at Presidio, in December, had risen and become so rapid as to be impassable. Two companies were left at Presidio (Camp Eagle Nest) in provision of further Mexican trouble. Here, at my request, I remained as post surgeon.

[*Arrived Galveston, by steamer from New York, July 31 or Aug. 2, arrived San Antonio Aug. 6; reported for duty at Fort Clark, Texas, August 20, and at Camp Eagle Nest, Texas, August 31. Havard's monthly reports, while his headquarters were in Presidio, show that he spent a portion of his time with troops in the field. His report of Sept. 30, 1880, mentions a trip already made to Meyer's Spring, to Peña Colorado, to the Chinati Mts. and to "Cibola Cañon near Fauer's Ranch". A later report shows that on December 20-24 he was on duty with Seminole scouts in the Chinati Mts.*].

Having always made a special study of Botany, especially economic and medical, and desirous to investigate the vegetation of Western Texas, still very imperfectly known at that time, I applied to accompany the Chief Engineer Officer of the Department (Major Wm. R. Livermore) then under orders to explore and study the natural history and resources of that country, and was accordingly assigned to his command.

I left Presidio in June, 1881, proceeded to Fort Davis and thence by stage to Fort Stockton and Fort Concho where I reported to Major Livermore, having had plenty of time to study the botanical features of the Rio Concho before his arrival. [*Left Presidio June 14; arrived Ft. Concho June 27; Livermore arrived July 28; expedition left Ft. Concho July 31, with Havard as Medical Officer*].

We left Fort Concho August 1 [sic] and proceeded northward to Abilene on the Texas Pacific[3]; then turning westward, followed in a

[3] The Texas and Pacific Railroad was pushed through, in the summer of 1881, from Fort Worth westward, and a junction with the Southern Pacific was effected at Sierra Blanca, January 1, 1882. At this time there was no other railroad in western Texas, making it necessary for Havard to go from Fort Davis to Fort Stockton and thence to Fort Concho (on the site of present San Angelo), by stage. The Southern Pacific was pushing eastward from El Paso at this same period; on May 22, 1882

general way the line of the railroad as far as the Guadalupe Mountains, the most interesting point of our exploration, where we spent most of September and October. Reached El Paso early in November and, after visiting the surrounding country, on both sides of the Rio Grande, returned by way of Fort Davis. Taking the train at Toyah, I arrived at San Antonio Dec. 12, 1881.

[*Havard, as dated by one of his monthly reports, was at Big Spring, with Livermore's expedition, on August 31. His report of Sept. 30 is dated at Pine Spring, at the southeastern end of the Guadalupe Mts., and the report of Oct. 31 is dated simply "Guadalupe Mts". On November 7 Havard, with Livermore, left the camp at the Guadalupe Mts. and proceeded to El Paso, thence returned to Barrel Spring (South of the Davis Mountains, Nov. 30) and Ft. Davis (Dec. 1?). Havard was relieved of expedition duty on December 6, and reached San Antonio December 13*].

On duty at Headquarters and post of San Antonio until August, 1882. Thereafter, until June, 1883, post surgeon at Fort Duncan (Eagle Pass). One incident well remembered while in the field with a scouting party in the neighborhood of this post is the terrible "norther" to which we were exposed in the open prairie, a revelation of the intense cold one may suffer from in winter (fortunately, not for more than a day or two) on the lower Rio Grande.

From June to October 1883, again with exploring expedition of Major Livermore, mostly in the Chinati Mountains and other little known points of the Great Bend of the Rio Grande [*Left San Antonio for Eagle Pass, Aug. 1, 1882. Arrived Fort Duncan, Eagle Pass, Aug. 2. Left Fort Duncan June 28, 1883, and reached San Antonio the next day, and reported again to Captain Livermore*].

[*The routes of the 1883 party, and especially those over which Dr. Havard travelled, can be determined a little more precisely from Havard's notes than from Livermore's published report*[4]. *The former left San Antonio July 3, and reached Fort Davis on July 8; presumably most of this journey was by rail. Livermore's account states that his party went to Bone Spring, presumably overland from Fort Davis, by way of Peña Colorado (by error printed "Pena, Colo." in his text)*[5]].

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the line had been opened as far as Strobridge, 314 miles from El Paso, and the track was laid nearly to the Pecos River, 40 miles farther east, leaving a gap of about 75 miles between the rails here and the extension westward from San Antonio. On January 15, 1883 the rails met at the Pecos Crossing, and transcontinental service began February 1. See Poor, Henry V., Man. R.R. of U.S., 1882, 1883.

[4] See Appendix II.

[5] The military post at Peña Colorado [about 3 miles southwest of present Marathon], was established about the beginning of the year 1880 by two companies of the 25th Infantry. -- Letter from Post Commander to the Adjutant General, December 20, 1880.

[*During the latter part of July the expedition explored for the most part what is now Big Bend National Park, from their supply camps at Bone Spring and at Tornillo Creek, on the north side of the Chisos Mountains. On July 31 Dr. Havard notes that he is with the troops at the Tornillo Camp. At least the second and third weeks of August may have been occupied in the trip, described by Livermore, down Maravillas Creek and the Rio Grande to a point near the mouth of San Francisco Creek, probably about 20 miles south of present Sanderson. Following this Livermore's account becomes somewhat vague, but a letter from Dr. Havard, at the Tornillo Creek camp, September 12, notes that he has just returned from an "extended exploration of the Chisos Mountains".*

[*Thus it may have been after the middle of September that the supply camp was moved to the Davis Ranch, as noted by Livermore. The "southern route" across country to the west, to intercept the Presidio road — the route then followed by Livermore and Havard — cannot be readily determined, but apparently all the parties met at Marfa about the end of this month or before. We find Havard in Ft. Davis on September 28, and near Marfa on the 30th. His movements during the early part of October are unknown, but on October 21 he had completed his work in western Texas and left Ft. Davis for San Antonio*].

From November [*1*], 1883, to October 9, 1884, attending surgeon at Department Headquarters, San Antonio; part of this time also in charge of the Medical Director's Office, and one or two weeks devoted to an exploring botanical trip to the lower Rio Grande, district of Fort Laredo [*Left San Antonio August 24, 1884, detailed on 7 days' duty to explore the lower Rio Grande. Was at Corpus Christi August 31, and returned to San Antonio, September 3*]. In October, 1884, ordered to the Department of the East and assigned to Fort Schuyler, N. Y.

My botanical investigations in Western Texas, with Major Livermore and at other times, were especially of rare and unknown species, or those not before collected in the United States. Full notes were also made of the economic and medical value of the more common plant species. Quite a number of species were new to botany, my name being given to several of them by Dr. Asa Gray and his colleague Sereno Watson. The full report of my botanical work in Texas was published by the Smithsonian Institution in 1885[6].

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[6] Havard, V. Report on the flora of western and southern Texas. Proc. U.S. Nat. Museum 8: 449 - 533. 23 - 30 S 1885. This report was based almost wholly on Dr. Havard's personal notes and collections made during his four years of army service in western Texas. The collections were donated to the Smithsonian Institution in 1885 [Smithsonian Accession no. 16688, estimated to add "probably 1500 species to the Herbarium"; letters, Havard to Spencer F. Baird, August 14, 1885 and October 14, 1885]. Havard's botanical work in western Texas was the

Transferred to Fort Wadsworth, Staten Island, N. Y. in February 1885.

Married, in November, 1885, A.J.H. of Bridgeport, Conn. First child (E.P.) born in 1886 at Fort Wadsworth.

Ordered for duty at Fort Lincoln, N.D., in 1887, at Fort Buford, N.D. (15th Inf. and 8th Cav.) in 1889, and at Fort D. A. Russell, Wyoming (17th Inf.) in 1891.

At Fort Russell, in addition to my duties as post surgeon, I organized and commanded, under instructions from the Surgeon General, a Hospital Corps Company of Instruction, being the second thus organized in the service. I may say that my interest in this important subject of the instruction and training of the Hospital Corps never lessened; that I have been a member of most of the boards convened to prepare and perfect the Drill Regulations of the Hospital Corps, and that at the date of my retirement (1910) no one had done more to bring our ambulance and field litter to their perfected state.

In 1894 I was transferred to Fort Slocum (Davids Island), N. Y., an artillery post as well as recruiting depot.

Shortly after the breaking out of the Spanish War, in compliance with orders, I left Fort Slocum, May 28, 1898, and, on the 31st, reported to Major General Joseph Wheeler, U.S.V., at Tampa, Fla., for duty as Chief Surgeon of the cavalry division. This division consisted of the 1st, 3d, 6th, 9th and 10th regiments, U.S.A., and the 1st U.S.V. (Rough Riders), in all about 5,000 men.

[*Here with the onset of the Spanish-American War we leave Major Havard's own account of his life. The rest of his long and useful career was devoted mainly to military medicine, a field in which he became internationally known. He was in Cuba from 1898 until 1902, and became in 1900 Chief Surgeon of the Department of the Island of Cuba, with supervision of all infectious diseases on the island. Following his Cuban service he held various posts in the*

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first significant accomplishment in that field since the work of the Mexican Boundary Commission in 1849 - 1853. His "Report" consists of two parts; Part I (pp. 449 - 497) is a "General View" including descriptions of the country and annotated floristic lists; Part II is entitled "Economic notes on the Texano-Mexican flora", and consists of a list of more than 200 species with notes on uses and sometimes on localities. Part I is divided physiographically, with sections devoted to valleys, hills, the Staked Plains, prairies, coast and mountains. Especially interesting to botanists are his descriptions of the flora in the vicinity of San Antonio (pp. 457 — 462), where he was stationed for about 19 months in two long periods; his description of the immediate valley of the Rio Grande; and his accounts of the flora of the Guadalupe, "Limpio" [Davis], Chinati, and Chisos Mountains. The accounts of the individual mountain ranges, as well as those of other areas in western Texas, bear witness to Dr. Havard's personal familiarity with the scenes he was describing, and provide a valuable documentary record of a vegetation now largely modified, where not entirely destroyed, by grazing animals.

United States. In 1904 he was detailed as medical attaché with the Russian army in Manchuria, was captured by the Japanese, and so was afforded an opportunity to see and report upon military hygiene and medical field service of both armies. In 1906 he was transferred to Washington, D.C., where he held position of President of the Army Medical School and the chair of military hygiene there until his retirement in 1910. He was the author of a standard textbook on military hygiene, published first in 1908. In 1917 Colonel Havard applied to be restored to active duty, and was assigned as a special adviser to the Cuban Army and Navy, which services were attempting to reorganize their medical departments. He remained in this duty until 1922 after which he made his home in Fairfield, Connecticut until his death on November 5, 1927].

Colonel Valery Havard, U.S.A., while President of the Army Medical School, 1906-1910 (from a photograph in the files of the Armed Forces Medical Library, Washington, D.C.)

Appendix I

A brief evaluation of Havard's botanical work

For the most part the name of Valery Havard is associated by botanists with western Texas, where he spent four productive years. The reasons for this are apparently two: his "Report on the flora of western and southern Texas" was published where it was readily accessible to botanists, and became widely known, and secondly, most of his herbarium specimens that have survived seem to have originated in Texas. Botanical literature contains occasional references to his specimens from the vicinity of Fort Pembina, or from North Carolina, but such citations are rare in comparison with the number based on Texan collections. I have never seen or heard of any botanical specimens resulting from his work in Arizona.

Dr. Havard's earliest (and except for his Texas report the most comprehensive) publications on botany were his two papers on the flora of the upper Missouri River basin. The second, and more important, of these is a well-annotated list of about 375 species, and includes general notes on geographical distribution of vegetation, and on climate, as well as notes on localities, habitats, flowering period, and dates observed, for individual species. This paper, and the preceding one which forms a part of it, are little-known to botanists, possibly because they were published in the Annual Report of the Chief of Engineers to the Secretary of War. They are mentioned, however, in Blankinship's Century of Botanical Exploration in Montana [Mont. Agr.Coll.Sci.Studies (Bot.) 1: 8 - 9. 1904].

In Texas, in addition to what time he could spare from his professional duties, Dr. Havard was officially detailed as botanist to Major Livermore's expeditions of 1881 and 1883, and doubtless had more time for botany than at any other time in his career. Although he did not discover a large number of species new to science (chiefly because of the thoroughness with which his predecessors on the Mexican boundary, Messrs. Wright, Parry, Schott and Bigelow, had combed the area 30 years before), he did have opportunities for long stays in several areas that had been poorly known, and his collections from these areas are important as early records of the flora. Examples of areas that were thoroughly collected by Havard are: San Antonio and vicinity; Eagle Pass and vicinity (including as far up the Rio Grande as the mouths of the Devils and Pecos Rivers); Presidio and vicinity, including the Chinati Mountains and the area as far north as Capote Peak; Guadalupe Mountains (southeastern slopes and southern summits), and Chisos Mountains (including the desert country to the north).

His contribution to botany did not stop with his collections. As was perhaps natural in one of his medical bent, Dr. Havard was much interested in ethnology, and particularly in ethnobotany. His published notes on economic plants, in his Texas report, comprised one of the most important sources of data for Coulter's *Botany of Western Texas* (Contr. U.S.Nat.Herb. 2: 1 - 588. 1891 - 1894). He was also the author of two widely cited ethnobotanical papers, *Food plants of the North American Indians* (Bull.Torr.Bot.Club 22: 98 - 123. 1895) and *Drink plants of the North American Indians* (Bull. Torr.Bot.Club 23: 33 - 46. 1896 [abstracted, with same title, in Amer.Jour.Pharm. 68: 265 - 268. 1896]), and published several shorter notes on similar subjects.

The United States National Herbarium, as noted above, contains the largest series of Havard's botanical specimens. The Gray Herbarium of Havard University also has certain important collections. Many of the Montana collections were originally determined by Sereno Watson, and Watson's help, with that of George Vasey, was acknowledged in the introduction to the Texas "Report". Havard's specimens in herbaria are not always completely satisfactory, for many of them were ultimately distributed with inadequate data. Many bear a general locality (e.g. "Western Texas") only, few bear a definite collection-date (usually month and year only). For botanists who may be interested in obtaining precise information about localities where he obtained specimens, the following general summary of his early travels and assignments is appended.

Chronological summary of Havard's work in western and southern United States, 1871-1880

	1871-1873
June, 1871	San Francisco, California, to Camp McDowell, Arizona
June, 1871 - July, 1873	Southern Arizona
Oct. 1874 - Apr., 1877	Fort Pembina, N.D.
	1877
May - November	Fort Lincoln, N.D., to upper Missouri and Yellowstone Rivers, and return.
	1878 - 1879
Oct. 1878 - Apr. 1879	Chattanooga, Tenn.
	1879
April - June	Bismarck, N.D., to upper Missouri River and Ft. Assiniboine, and return
	1879 - 1880
June, 1879 - June, 1880	Fort Johnson, North Carolina

Chronological Summary of Havard's sojourns in Texas

1880	
August	Galveston to Presidio, via San Antonio, Fort Clark (near Brackettville, Kinney County), thence probably to Del Rio, but the remainder of the route unknown to me.
September - December	Post Surgeon at Camp Eagle Nest, Presidio. Probably most of his knowledge of the Chinati Mountains gained during this period.
1881	
January - June	Post Surgeon at Presidio.
June 14 - 27	Presidio to Fort Davis (doubtless via Marfa, and on horseback); thence by stage to Ft. Stockton and Ft. Concho (present San Angelo, Tom Green County).
July	Fort Concho, awaiting Livermore's arrival, with little to do except botanize.
August	Fort Concho to Abilene and Big Spring.
September	Big Spring to the Guadalupe Mts. (camp at Pine Spring). The route probably went from Big Spring west to a point between present Odessa and Monahans, south to the Pecos River near the falls (below present Grandfalls), up the Pecos to near the mouth of Delaware Creek (about the border of New Mexico) and then generally westward to Pine Spring.
October	Guadalupe Mountains, especially the southeastern parts and foothills.
November 7 - 30	Pine Spring to El Paso (probably via the Hueco Tanks), and return to Barrel Spring and Fort Davis.
December	On duty at San Antonio
1882	
January - July	On duty at San Antonio
August - December	Post Surgeon at Fort Duncan, Eagle Pass.

1883

January - June	Post Surgeon at Fort Duncan, Eagle Pass.
July 3 - 8	San Antonio to Fort Davis, probably by rail at least to Marfa.
July 8 - mid-September	With expedition camped in present Brewster County, north of the Chisos Mountains
mid-September - October	Expedition centers at Marfa, Presidio County, and vicinity
November - December	Department Headquarters, San Antonio

1884

January - October 9	Department Headquarters, San Antonio, with a trip toward the lower Rio Grande, across to Corpus Christi and return.

Appendix II

The explorations of Major Livermore in Texas, 1878 - 1883.

In 1878, when Major W. R. Livermore was assigned to duty as engineer officer of the Department of Texas, the western part of the state was almost entirely unsurveyed and parts were quite unknown. In July, 1880, Major Livermore was sent out to explore the country west of the Pecos River, with a view to the selection of sites for new army posts and to obtain a general knowledge of the region. Preliminary mapping operations were undertaken in the Chinati Mountains in the fall of this year. In July, 1881, began "another expedition to survey and explore the country between the line of the Texas and Pacific Railroad and the head of Red River, also the country in Texas north and west of Fort Davis, towards Fort Bliss, including the Guadalupe Mountains, with references to sites of military posts". Major Livermore was furnished with 30 infantry, 30 cavalry, 6 Indian scouts, with 7 wagons and 20 pack mules. Dr. Havard accompanied the expedition as surgeon and botanist; other officers had as their special charges the subjects of triangulation, astronomy, topography, and geology. The party "arrived at Abilene, on the Texas and Pacific Railroad, August 4, and traveled along the line of the railroad until September 5, when it crossed the country to the Pecos River, up this

river to Pope's Crossing[1], and thence to Pine Spring, in the Guadalupe Mountains, where it arrived September 25." Supplies for the field encampment at Pine Spring, which was occupied until November 14, were sent by rail to Toyah. From Pine Spring the expedition returned to Fort Davis (November 22), and on December 7 the officers were all ordered back to their respective posts.

The country explored by the 1881 party actually included chiefly that from Fort Davis to the Guadalupe Mountains, and west to El Paso. The topography of all this country was duly sketched, and nearly all the mountain summits connected by triangulation.

In 1883 another expedition was sent out, at Major Livermore's request, to complete the survey of the country west of the Pecos. Dr. Havard joined the party in San Antonio on June 29. The official report says "The expedition started on the 1st of July and proceeded, via Pena, Colo. [sic], to Bone Spring. Here Lieutenant [S.W.] Fountain was left in charge of a supply camp, while the country to the south was explored and surveyed as far as the Rio Grande. The supply camp was moved to Tornillo Creek on the 1st of August."

Immediately after August 7 the exploring parties were withdrawn from the area south of the supply camp, and with all the cavalry, scouts, and pack-train the expedition followed Maravillas Creek to its mouth, and then went down the Rio Grande to a point near San Francisco Creek, and returned to camp on Tornillo Creek after having completed the reconnaissance and survey of the country to the east. The supply camp was then moved to Davis Ranch, and the surveying parties proceeded by three different routes to cover the ground as far as the Presidio road. "With Dr. Havard and Lieutenant [E. B.] Ives", Livermore took the "southern route". The report, in continuing, states that after a few weeks in the country around Marfa, the party was again divided: one detachment to follow down the Rio Grande from the Vieja Mountains to Polvo, one to remain at Marfa, one to occupy Guadalupe Peak and survey the surrounding country, and a fourth, including Major Livermore, to go north and east as far as Fort Stockton. The parties all assembled at Fort Davis at the end of October, and the expedition was broken up. For the above, and further details, see Major Livermore's report, in Ann. Rept. Chief Engineers, U. S. A. 1884: 2391-2396. 1884 (House Exec. Doc. 1, pt. 2, vol. II, 48th Congress, 2nd Session).

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[1]Captain Pope, enroute from El Paso to the Red River, "discovered an excellent crossing" of the Pecos River near the mouth of Delaware Creek, just within the borders of New Mexico. This was on March 8, 1854. See Rept. Expl. & Surv. Miss R. to Pac. Ocean 2: 59. 1855 (Senate Exec. Doc. 78, 33rd Congress, 2nd Session).

WILHELM HILLEBRAND
1821-1886

Otto Degener [1]

ONE HUNDRED YEARS ago, a man in search of health came to the kingdom of Hawaii, then known to the outer world as the Sandwich Islands. The man, Dr. Wilhelm Hillebrand, not only regained his health but served his adopted country. He gave the people of Hawaii wise advice, both as their physician in the sick room, and as a member of the Privy Council in the court of Kamehameha V. He radically influenced the racial make-up of the Islands. He beautified and enriched Hawaii nei by importing the choicest shade and flowering trees, valuable introductions from the farthest corners of the earth. He diligently collected and expertly studied the plants native to the Hawaiian Islands. His botanical researches culminated with the publication of a Flora that has been the valued handbook of two generations of local scientists.

Wilhelm Hillebrand in his earlier years. (Published by courtesy of the Honolulu "Star-Bulletin.")

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[1] From Hawaii Weekly, Nov. 18, 1951.

Dr. Hillebrand was born in Nieheim, Westphalia, a province of Prussia at the time and now in the British occupation zone, on Nov. 13, 1821. He was the son of Judge Franz Joseph Hillebrand and Louise Pauline (Koenig) Hillebrand. His sisters, Pauline and Wilhemina, both died young. His brothers were Heinrich, Franz and Herman. The latter, brother-in-law of the Rev. Sereno E. Bishop, was a prosperous dairyman near Honolulu until his death. Completing his early education at Nieheim, Wilhelm studied in Goettingen, Heidelberg and Berlin.

After receiving his degree in Berlin, Hillebrand practiced medicine in Paderborn, near his birthplace, a few years until illness, presumably pulmonary tuberculosis, forced him to cease. Searching for a more healthful climate, he sailed to Australia, then to the Philippines. In Manila he resumed the practice of his profession until declining health induced him again to travel, this time to San Francisco. Not satisfied, he sailed for the Hawaiian Islands, arriving just 100 years ago. The following year, Nov. 16, 1852, he married Anna Post, stepdaughter of Dr. Wesley Newcomb, prominent local physician and amateur conchologist.

Dr. Wilhelm, or William, Hillebrand, according to the description of Dr. Willis T. Pope in Thrum's Annual for 1919, at middle age was a "quiet, sober, practical man of medium height and weight, complexion fair, eyes gray and as possessing an abundance of rather dark hair. He was fond of his family and took particular interest in the education of his children, two sons, William Francis and Henry Thomas . . . The doctor was very fond of music and enjoyed playing on the piano, but his favorite recreation was that of working among his horticultural specimens in his home garden."

Soon a favorite family physician in Honolulu, Dr. Hillebrand included the royal family among his patients. He was a physician of Queen's hospital for most of the time from its founding by Queen Emma until his departure from the Islands. He was connected with the insane asylum, and was a member of the board of health. He was likewise in partnership with J. Mott-Smith, their drugstore standing at Hotel and Fort Sts., Honolulu.

With the natives dwindling in numbers due to the advent of diseases and customs novel to them, Dr. Hillebrand spent considerable time in repopulating the Islands from outside sources. In April, 1865 as commissioner of the bureau of immigration, accompanied by his family, he traveled to China, India and Malaya to arrange for the importation of laborers. At the same time he was also to investigate means for control of "mai pake" or leprosy, then incurable and of relatively recent introduction into the Hawaiian Islands. In 1877 he arranged for the emigration of workers from Madeira, where he was then living, and the Azores, to Hawaii. This pioneer group of 180 Portuguese reached Honolulu Sept. 30, 1878.

Long associated with the Royal Hawaiian Agricultural society and its corresponding secretary, Dr. Hillebrand arranged for the introduction of desirable seeds — as of the monkeypod and royal palm — for growing in Honolulu, at that time rather bleak and dusty.

When he was about to set out in his search for immigrants in 1865, the society and the Planters' association jointly appropriated $500, a worthy sum those days, for the introduction of worthwhile plants and animals. In the Hawaiian Gazette for July 28, 1866, is the report that Dr. William Hillebrand had forwarded 10 Wardian cases from Singapore, nine from Calcutta, one from Ceylon, eight from Java and two from China containing plants and chiefly birds. From this and subsequent records we learn that Dr. Hillebrand's importations, not every one wise, included camphor, cinnamon, jak fruit, litchi, mandarin orange, Chinese plum, Java plum, several kinds of eugenias and banyans, and a considerable number of other useful or ornamental plants. He likewise imported carrion crows, goldfinches, Japanese finches, linnets, mynah birds, Chinese quail, rice birds, Indian sparrows, golden, silver and Mongolian pheasants, and a pair of deer each from China and Java.

The introduced seeds and growing plants were distributed throughout Honolulu, their progeny by this time gracing gardens and streets throughout the Islands. Many trees, now veritable giants, planted by Dr. Hillebrand himself, are still standing about Queen's hospital, on the grounds of the old plant nursery at King and Keeaumoku Sts., and especially about the spacious grounds of the doctor's former home on Vineyard and Nuuanu Sts.

The Hillebrand homestead, passing through several successive ownerships since the doctor's departure from the Islands, was saved from "progress" and real estate subdivision by the generosity and wisdom of Mary Foster and Harold Lyon. Now known as Foster Park, it attracts local residents and tourists alike with its magnificent trees and lovely flowers.

Though Dr. Hillebrand resided in the Hawaiian Islands only the 20 years, from 1851 to 1871, he maintained his interest in their flora until his death 15 years later. He visited all the larger islands of the group, often with his son William, botanizing wherever possible. He employed Hawaiians as guides, and attracted to himself congenial companions like young John Lydgate and Horace Mann, the latter the son of the famous educator. He carefully preserved and studied these plants as well as those which correspondents on various islands sent him.

Asa Gray, a professional botanist at Harvard, had described some new plants collected in the Hawaiian Islands chiefly by the U. S. exploring expedition under Commander Wilkes. In the winter of 1871-72 Dr. Hillebrand lived in Cambridge, Mass., to begin with Prof. Gray's

assistance the manuscript of his monumental "Flora of the Hawaiian Islands: A Description of their Phanerogams and Vascular Cryptogams." Thereafter Dr. Hillebrand traveled extensively in Germany and Switzerland, in Madeira and Teneriffe. He returned finally to Heidelberg, where he had spent such pleasant student years, to end his days.

Wilhelm Hillebrand in his later years. (Photograph by Dr. W. T. Pope.)

Though already painfully ill for two years, he managed to complete writing much of his manuscript, submitting part of it to "Carl Winter, University-Bookseller." Dr. Hillebrand, after having the satisfaction of correcting the first few pages of proof, died July 13, 1886, his remains being interred in the cemetery near Heidelberg and overlooking the Rhine.

Fortunately, his son Dr. William F. Hillebrand, chemist then connected with the bureau of standards in Washington, D. C., with the help of Prof. E. Askernasy of Heidelberg, carefully and expertly edited the work, publishing it posthumously in 1888.

Curiously enough, though Dr. Hillebrand's Flora of almost 800 pages is written in English, it was evidently printed in Heidelberg, the Prussian government contributing 1,000 marks toward defraying expenses. How large an edition was printed I do not know.

Though the book, long thought out of print, has been a rare collectors' item and invaluable aid to botanists interested in Hawaiian plants, I discovered unbound copies in Germany some 20 years ago, importing several dozen for local use. This German supply was probably lost during the second world war.

A few of Dr. Hillebrand's historical herbarium specimens exist, mostly in fragmentary form in the Bishop Museum and in other institutions in America and Europe. The main collection, following a verbal wish expressed a few hours before his death, had been bequeathed to the botanical museum at Berlin-Dahlem. This collection of inestimable scientific value was almost totally destroyed, excepting for the ferns, toward the latter days of the Second World War by our air force.

Dr. Hillebrand's Flora was an excellent book for its time, superior in many ways to Floras written by contemporary professional botanists. But botany and other sciences are not static. They have progressed by leaps and bounds since 1888. Also, new roads and trails have been opened up in the Islands, enabling present botanists to penetrate regions closed in Hillebrand's time and harboring plants hitherto unknown.

Not only that, thousands of exotic plants have reached our shores, both purposely and accidentally by man since 1888. A modern Flora Hawaiiensis must include all these. To be correct it must be built upon the firm foundation established by our greatest pioneer botanist, Dr. Hillebrand.

Dr. William Hillebrand, versatile citizen of the kingdom of Hawaii, was one of the titans of his time. Hawaii nei gained immeasurably by his 20 years' residence.

Otto Degener: Botanist of the South Seas — Otto Degener, author of the article on Wilhelm Hillebrand, which we have reprinted (with the kind permission of "The Honolulu Advertiser," in which it first appeared) is of course best known to our readers as the author of "Flora Hawaiiensis or the new illustrated Flora of the Hawaiian Islands," but he has written much else, including, besides articles in various journals, his "Illustrated Guide to the more common or noteworthy Ferns and Flowering Plants of Hawaii National Park, with Descriptions of ancient Hawaiian Customs and an Introduction to the Geologic History of the Islands" (1930) and "Naturalist's South Pacific Expedition: Fiji" (1949). Extremely active in the study of the plants of Polynesia and Melanesia, he has had, until recently, a very distinctive name in botanical authorship. That may, however, be no longer true in the future for in 1953 he married Dr. Isa Hansen, formerly of the Berlin Botanical Garden, after a botanical correspondence of several years.

Degener was born at Orange, New Jersey, 13 May 1899; graduated B. S. at Massachusetts State College, Amherst, 1922; M. S., University of Hawaii, 1923. He also carried on research at the Woods Hole Biological Station, Columbia University, and the New York Botanical Gardens; since 1935 he has been connected with the latter institution as collaborator in Hawaiian Botany. In June 1952 the degree of Doctor of

Science was conferred upon him by the University of Massachusetts, which thus appropriately honored one of its leading botanical alumni.

From 1925 to 1927 Degener was Instructor in Botany at the University of Hawaii. Subsequently he was Naturalist at the Hawaii National Park. In 1940 he was botanist on the Archbold Cheng-Ho Expedition to Melanesia.

In 1947 Degener was able to purchase the expedition's 99-foot teak and camphorwood yacht, the "Cheng Ho." He organized, with a dozen stockholders, most of them American citizens, the Cheng Ho Trading and Exploring Co. In the group, unfortunately, was the former Vichy-French Consul at Honolulu, who registered the yacht in his own name in Tahiti, and involved the Company in a long litigation.

During his career as botanical explorer in the Pacific, Degener has distributed some 200,000 specimens to various institutions, and of course some of them have come to the University of Michigan. Many species have been named for him, the most notable being a unique "tree buttercup" of Fiji, *Degeneria*, the type of a new family, *Degeneriaceae*.

At the 34th International Flower Show in Grand Central Palace, New York, Degener was designated as "the outstanding botanist or naturalist of the Pacific." — H. H. B.

Botanists Dr. Otto Degener and Dr. Isa Hansen Degener, of Waialua, Hawaii.

LINACEAE IN MICHIGAN

C. M. Rogers

The family is represented in Michigan by the single genus *Linum*.

Erect annual or perennial herbs; leaves simple, entire, sessile; flowers regular; sepals, separate petals, stamens, and carpels five (the last apparently ten); fruit a ten-seeded capsule.

Key to Species

1. Flowers blue or white with yellowish base; fruiting pedicels mostly more than 1 cm. long, plants annual.
   2. Petals blue, 10 mm. long or more; stigmas elongate; leaves alternate . . . . . 1. *L. usitatissimum*
   2. Petals white with yellowish base, 5 mm. long or less; stigmas capitate; leaves opposite. . . . . 2. *L. catharticum*

1. Flowers yellow; fruiting pedicels mostly less than 1 cm. long; plants perennial (except *L. sulcatum*).
   2. Annual; sepals more than 4 mm. long, all glandular serrate; styles united below . . . . . 3. *L. sulcatum*
   2. Perennial; sepals 3.5 mm. long or less, all entire or only the inner glandular serrate; styles distinct.
      3. Inflorescence corymbose with stiffly ascending branches; inner sepals conspicuously glandular serrate (Fig. 1, A and B). . . . . 4. *L. medium*
      3. Inflorescence either corymbose with slender flexuous branches (Fig. 1, C) or paniculate (Fig. 1, E); inner sepals glandless or with inconspicuous glands. (Fig. 1, D)
         4. Inflorescence corymbose with slender flexuous branches; stem terete or nearly so; leaves mostly alternate . . . . . 5. *L. virginianum*
         4. Inflorescence paniculate, branches stiffly ascending; stem conspicuously striate-angled above; leaves mostly opposite . . . . . 6.

1. *L. usitatissimum* L. Common Flax. Map I. This, the cultivated flax, is a casual weed along roadsides, railroads, and other waste places in all parts of Michigan, though most of the collections come from the southern part of the state.

Throughout most of the U. S.; introd. from Eur.

Specimens examined:[1] BERRIEN: *Ames*, July 30, 1867 (MICH); EMMET: *Clayberg and Fallass 1997* (ALBI); GRATIOT: *Davis*, Aug., 1892 (MSC); INGHAM: *Skeels*, July 4, 1894 (MSC); KALAMAZOO: *Hanes and Hanes*, Grand Trunk R. R. (CRH); KENT: *Skeels*, Sept. 1, 1895 (MSC); KEWEENAW: *Farwell*, July 25, 1885 (BLH); MARQUETTE: *Barlow*, Aug. 17, 1901 (MSC); MIDLAND: *Dreisbach 2258* (RRD); OAKLAND: *Farwell 9031* (BLH, MICH); ST. CLAIR: *Dodge*, Aug. 24, 1892 (MICH); ST. JOSEPH: *Rogers 7787* (WAY); WASHTENAW: *Billington*, Sept. 3, 1917 (WAY); WAYNE: *Farwell*, Aug. 25, 1892 (BLH).

2. *L. catharticum* L. Fairy Flax. Map II. This little annual is adventive in Michigan from the east. It is known in the state only from two collections, both from Keweenaw County. One of these consisted of several dozen plants, indicating that at the time it was at least locally plentiful.

Newf. to N. S. and N. Y., w. to no. Mich.; natzd. from Eur.

Specimens examined: KEWEENAW: *Farwell 12555*, near Central Mine, Aug. 6, 1940 (BLH); *Farwell 13057*, near Horseshoe Harbor, Sept. 13, 1942 (BLH).

MAP I

L. USITATISSIMUM

MAP II

■ L. CATHARTICUM ● L. SULCATUM

[1] One specimen is cited from each county; the counties are considered alphabetically; for list of symbols used to designate herbaria, see Asa Gray Bulletin N. S., Vol. II: 267-268. 1953.

MAP III

L. MEDIUM

MAP IV

L. VIRGINIANUM

3. *L. sulcatum* Riddell. Grooved Yellow Flax. Map II. This species is limited to prairie areas in the southern part of the state. A rare plant in Michigan, it is known only from about a half dozen scattered collections.

Mass. to Man., s. to Ga. and Tex.

Specimens examined: KALAMAZOO: *Houghton*, August 1, 1838 (NY); KENT: *Cole*, July 30, 1896 (MSC); NEWAGO: *Bazuin 3925* (BLH); OAKLAND: *Farwell 8132* (BLH); TUSCOLA: *Dodge*, Sept. 18, 1910 (MICH, US).

4. *L. medium* (Planch.) Britton. Stiff Yellow Flax. Map III. With the exception of a single specimen from Van Buren County, collections of this species have come from the southeastern part of the state where it is found in open sandy fields. Out plants are var. *texanum* (Planch.) Fern. which is generally larger than the typical variety, with somewhat thinner leaves and more glandular serrate inner sepals. *L. medium* is one of a complex of species which includes *L. virginianum* and *L. striatum*, but is ordinarily easily distinguished from those species by the glandular serration of the inner sepals. In addition the principal cauline leaves of *L. medium* are predominantly broadest below the middle while those of the other two species are commonly broadest at or above the middle, while the habits of the three species also differ. Though the gross features vary somewhat, most Michigan material of *L. medium* can be readily placed without resorting to a lens.

Me. to s. Mich., s. to Fla. and Tex.

Specimens examined: HURON: *McVaugh 12461* (BLH); LIVINGSTON: *Farwell*, July 16, 1905 (BLH); OAKLAND: *Billington*, Aug. 7, 1920 (MICH, WMC); ST. CLAIR: *Dodge* , Aug. 20, 1895 (MICH, MSC, NY); VAN BUREN: *Kauffman*, July 18, 1910 (MICH); WAYNE: *Billington*, June 28, 1914 (BLH).

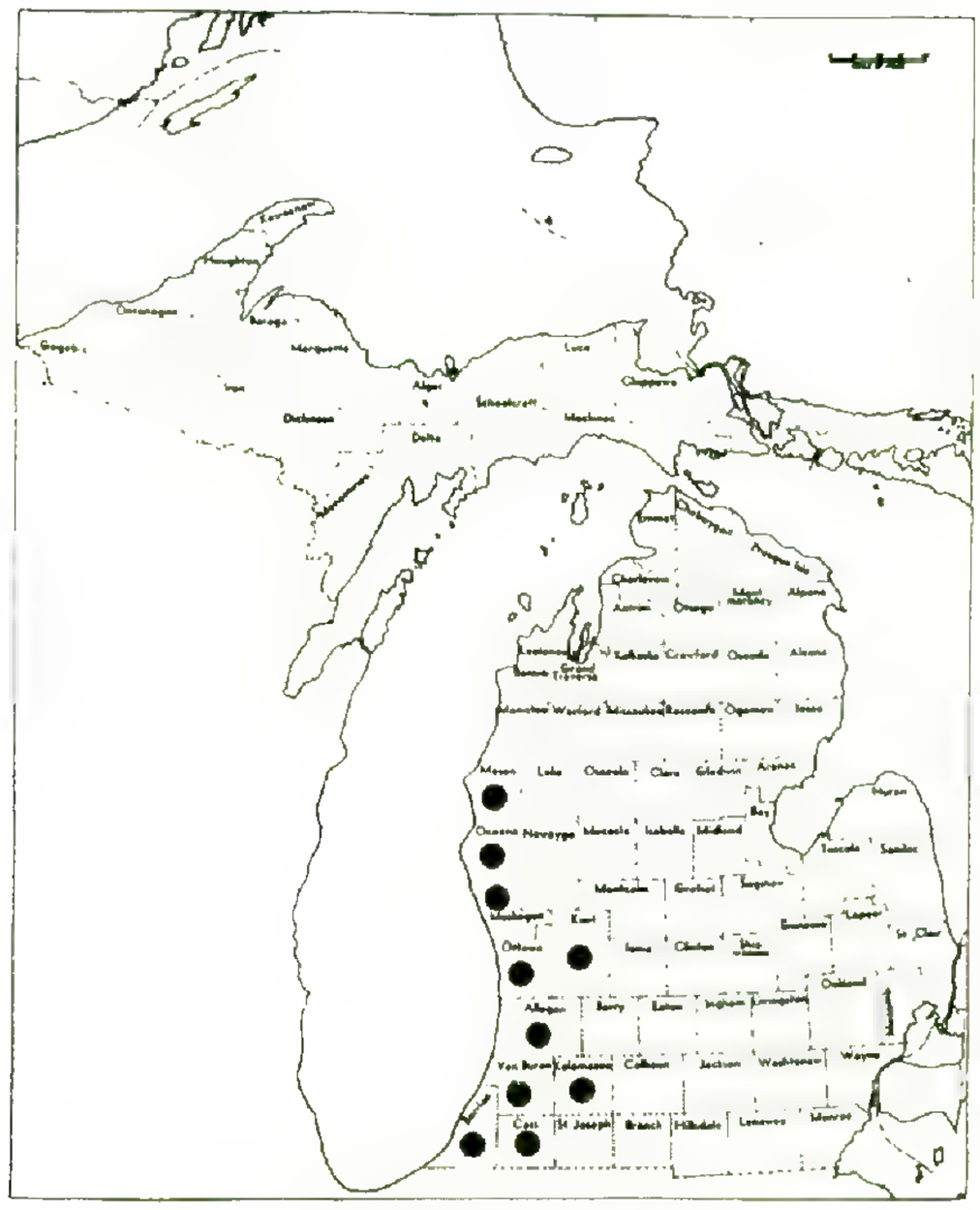
5. *L. virginianum* L. Slender Yellow Flax. Map IV. Scattered collections of this species have come from dry to moist soil, hillsides and open woods from several counties in the southern part of the state. As with *L. medium* and *L. striatum*, Michigan specimens come from the northern and western edge of the total range.

Mass. to s. Mich., s. to Ga. and Ala.

Specimens examined: BERRIEN: *Ames*, July 26, 1867 (MICH); EATON: *Wheeler*, Aug. 23, 1894 (MSC); INGHAM: *Hicks and Wheeler*, June 19, 1891 (US); KALAMAZOO: *Hanes and Hanes 2035* (CRH); KENT: *Fallass* , 1899 (ALBI); MACOMB: *Cooley*, July 7, 1850 (MSC); OAKLAND: *Bingham*, July 22, 1936 (BLH); WASHTENAW: *Foote*, Aug. 3, 1862 (MICH); WAYNE: *Farwell 7842* (BLH).

6. *L. striatum* Walt. Ridged Yellow Flax. Map V. This species is found in low, damp, commonly sandy soil, occasionally in drier situations, in southwestern Michigan. Flowers and fruit are quite similar to those of *L. virginianum*, but is distinguished from that species by the stricter habit, the prominently striate stem, and the larger proportion of opposite leaves. Some material, such as *Hebert*, June 30,

MAP V



L STRIATUM

Fig. 1. A, habit, B, inner sepal, *L. medium*; C, habit, *L. virginianum*; D, inner sepal, *L. virginianum* and *L. striatum*; E, habit, *L. striatum*.

1932 (NDL, *Bazuin 5018* (BLH), and *Katz*, Aug. 9, 1951 (BLH), appears to be intermediate, indicating that hybridization between these two species is likely. Additional collections should be made where the ranges of the two overlap in the southwestern part of the state.

N. E. to s. Mich., s. to Fla. and Tex.

Specimens examined: ALLEGAN: *Bazuin 5018* (BLH); BERRIEN: *Lansing 2876* (F, GH, US); CASS: *Pepoon*, Aug. 1905 (MSC); KALAMAZOO: *Hanes and Hanes 1816* (CRH); KENT: *Bazuin 606* (AQ); MASON: *Katz*, Aug. 19, 1951 (BLH); MUSKEGON: *McLouth*, July 20, 1899 (MSC); OCEANA: *F 293010* (F); OTTAWA: *Kauffman* , Aug. 16, 1910 (MICH); VAN BUREN: *Kaufmann* , July 25, 1910 (MICH).

Excluded Species

L. grandiflorum L. A single collection which appears to be this species, *Farwell*, from "Detroit" (BLH), was probably an escape from cultivation.

L. Lewisii Pursh. One collection, *Podolski*, also from "Detroit" (MICH), was probably under cultivation, since this species if known only from farther west.

REFERENCES

Deam, C. C. Flora of Indiana. Linaceae: 629-631. 1940.

Fernald, M. L. Gray's Manual of Botany, Ed. 8. Linaceae: 940-943. 1950.

Gleason, H. A. New Britton and Brown Illustrated Flora of the Northeastern United States and Adjacent Canada. Linaceae: Vol. 2: 462-465. 1952.

Lawrence, G. H. M. Taxonomy of the Vascular Plants. Linaceae: 553-554. 1951.

Nestler, H. Beiträge zur systematischen Kenntnis der Gattung *Linum*. Beih. Bot. Centralbl. 50 (2): 497-551. 1933.

Small, J. K. Linaceae. North American Flora. 25: 67-87. 1907.

Winkler, H. Linaceae. In Engler and Prantl, Die Natürlichen Pflanzenfamilien, Ed. 2, Bd. 192: 82-130. 1931.

NATHAN A. COBB, BOTANIST AND ZOOLOGIST, A PIONEER SCIENTIST IN AUSTRALIA

Frieda Cobb Blanchard[1]

In the United States, it is mainly for his work on nematodes, started in Jena as a doctoral dissertation and continued with never-waning ardor, that Nathan Augustus Cobb will always be known. But on the other side of the world, in Australia and Hawaii, he will be remembered for the first half of his career, and will be thought of as a botanist, especially a pathologist, whose work with plant diseases was of economic importance as well as of permanent scientific value. It is with his early life and his years as a botanist that this account is concerned.

CHILDHOOD AND YOUTH IN SPENCER, MASSACHUSETTS, 1859-1876

The story of how Nathan A. Cobb became a botanist should perhaps begin with an account of the school days of Alice Vara Proctor, who later became his wife. It was her early love of the study of flowers and plants which had a good deal to do with his earliest botanizing. The farm of her father, Edward Proctor, lay about two miles from the little town of Spencer, in Worcester County, Massachusetts. There his children went to school, and attended the Congregational Church, of which he was a deacon. Until 1856 there was no high school in Spencer. "There was, at irregular times", my mother, Alice Proctor Cobb, told us nearly a century later, "a select school taught for a few months at a time by some college student or graduate, in need of funds to continue his education, who would come to the town, canvass it for pupils, and hold classes for a limited number of weeks at so much a pupil." But in time for the younger Proctor children, the town grew to the size at which a high school was required by law. Alice attended eagerly the classes of her choice until in 1872 she and two others were graduated from the Spencer High School as its first class. Recently I have learned that it was then a greater distinction for her to be

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[1]Second daughter of N. A. Cobb. His three other daughters (Margaret Vara Cobb of Concord, New Hampshire; Ruth Cobb Ross of Golden, Colorado; and Dorothy Cobb Adams of Falls Church, Virginia) made many helpful suggestions during the preparation of this account. His three sons are not living.

graduated from high school than it was for her five children in their day to receive college degrees, or perhaps for her grandchildren to receive their master's and doctor's degrees today.

Seventy years later, in 1940, when my mother was eighty-six, she told us (and her words were written down): "Until my last year at high school, 1871-1872, there was no course of study, but each pupil could enter any class in which he could do the work, and I had early joined a class starting botany. Our textbook was "How Plants Grow Gray" as we called it. It was my first introduction to plant study in any form and it was a new world to me. I soon became deeply interested and my interest has never ceased. Three springs, I think, I studied our little textbook on botany, as no further course presented itself. Then our principal (the 'faculty' consisted of principal only) suggested to another girl and myself that we take a higher course, using Wood's textbook (he was a Yale man!). This we did, and even attempted herbariums. I pressed my specimens in an old cheese-press lent to me by my mother. Many years later I realized that both my mother and my father had a strong interest in outdoor matters, beyond coming home from the berry-pasture with a full pail, or completing successfully the haying in the lower meadow. This meadow was so swampy that we children were not allowed to go into it by ourselves; the horses, when working there, had to wear strapped, buckled-on, wooden shoes to prevent them from sinking in. (They didn't like these, laid back their ears when they saw them, and did not seem happy until they got them off.) The grass there was of a very coarse, tough variety, used only for bedding the animals, and the flowers were somewhat different from those of the uplands. When working there, my father would bring me any flower he saw which might be new to me."

Perhaps that calla, legendary in our family, came from this meadow. It was one of the first flowers she pressed, and it remained long in the press, and long in the memory of the young botanist. Her ideal herbarium specimen was brittle and paper-thin, and she was determined to bring the calla to this ideal. I think it became a permanent occupant of the press.

If my mother led my father into his early botanizing this came about because she had had opportunities, at home and at school, that he had not; and, moreover, she was five years older than he. His natural interest and ability were not less than hers. But while my mother's family had a permanent farm home and a normal family life, my father, an only child, had since birth (June 30, 1859) been moved from one temporary home to another, on an average of nearly once a year. After he was fourteen, he had no home in the ordinary sense. His father, William Henry Cobb, was at various times a

Nathan Cobb at about five years of age.

carpenter, builder, contractor, wright, sawmill manager, factory foreman and farmer, and he moved from place to place as his work required, so there was never for long a fixed home for his family. He was a skillful and versatile man; and because his son, Nathan, resembled him in many ways, it seems likely that the father, too, was unusually enterprising and even adventurous. Anyway, about nine years after William Henry Cobb came back from the Civil War, he took the long trip to California, perhaps thinking that his health, which had been damaged during his months of active soldiering in the South, would improve there. His wife, a practical nurse, supported herself from then on. The plan was for the wife and son, then fourteen years old, to join him as soon as he could save money enough for the fares. After a time he sent enough for one fare. But the mother would neither send the son alone nor leave him; so they waited for the second fare, which never came. Occasionally they had word. It was not until long afterward, when there had been no letter for years, that they learned that he had suffered loss of memory after being injured by a falling log.

Until Nathan was fourteen, when his father went west and he became self-supporting, he worked at various jobs under his father's direction, generally without regular wages. In that rural region it was not then uncommon for farm boys to be in school for the winter term only (three months), when their help was not needed for the crops. For my father, this was a most fortunate thing, he felt later (though at the time it was heart-breaking, as he had always taken the greatest interest in his books); he once said that if asked what parts of his early training had most influence on the success of his later work, he would give a high place to his early intimacy with a great variety of practical operations. Before he was fourteen, he had, for weeks at a time, been left in charge of a 150-acre farm, with stock and crops, while his father was away on a contract; and he was often left in charge of the wire

mill. (Drawing wire was the local industry for which Wire Village was named.) He learned manual skills, how things should be done, and what it meant actually to do them. The result was that for the rest of his life he was able to put his ideas and inventions into material form as devices, instruments, buildings. An active craftsman and technician to the end of his career, he built not only darkrooms but cameras; not only laboratory table and window installations for using the microscope, but microscopes too. Generally when he bought a microscope, camera or other instrument he quickly saw some way in which it could be improved, and straightway altered or added to it.

Little Nathan's first regular employment for wages came when he was eight years old. He had attended school during the winter term without absence or tardiness; he was, in fact, too studious and zealous in his school work. The offering of prizes by the teacher was perhaps a good way to encourage effort in the class; but this little boy, who loved his books and lessons, was over-stimulated. He became restless in his sleep, spelling aloud long lists of words and repeating other memorized matter. The doctor whom his parents consulted suggested taking the boy from school and setting him to other tasks. This was done; and to make the break more complete, and lessen the chance of his meeting his schoolmates, his father put him to work on the night shift in the shingle mill which he was then managing. Here the boy stacked shingles by night, sleeping by day, and was paid as a regular mill hand. His children and grandchildren remember this story, for each in turn used and passed down the little silver fork which was a souvenir of an episode of this time.

At the end of the season, he came home quietly with his earnings in his pocket, and being the silent son of a taciturn mother said nothing about it. Next day he went to the accustomed place for his overalls and found the peg empty. He turned to his mother. She answered his look: "When overalls get so pitchy that they'll stand alone, it's time they were burned!"

Poor boy — and poor mother! She had no means of replacing the burned paper money. There was nothing said, I believe. But after her next trip to town, he found at his place at table a child's silver-plated fork with his initials engraved on it. Again, I suppose, nothing was said; but he understood a meaning in the gift.

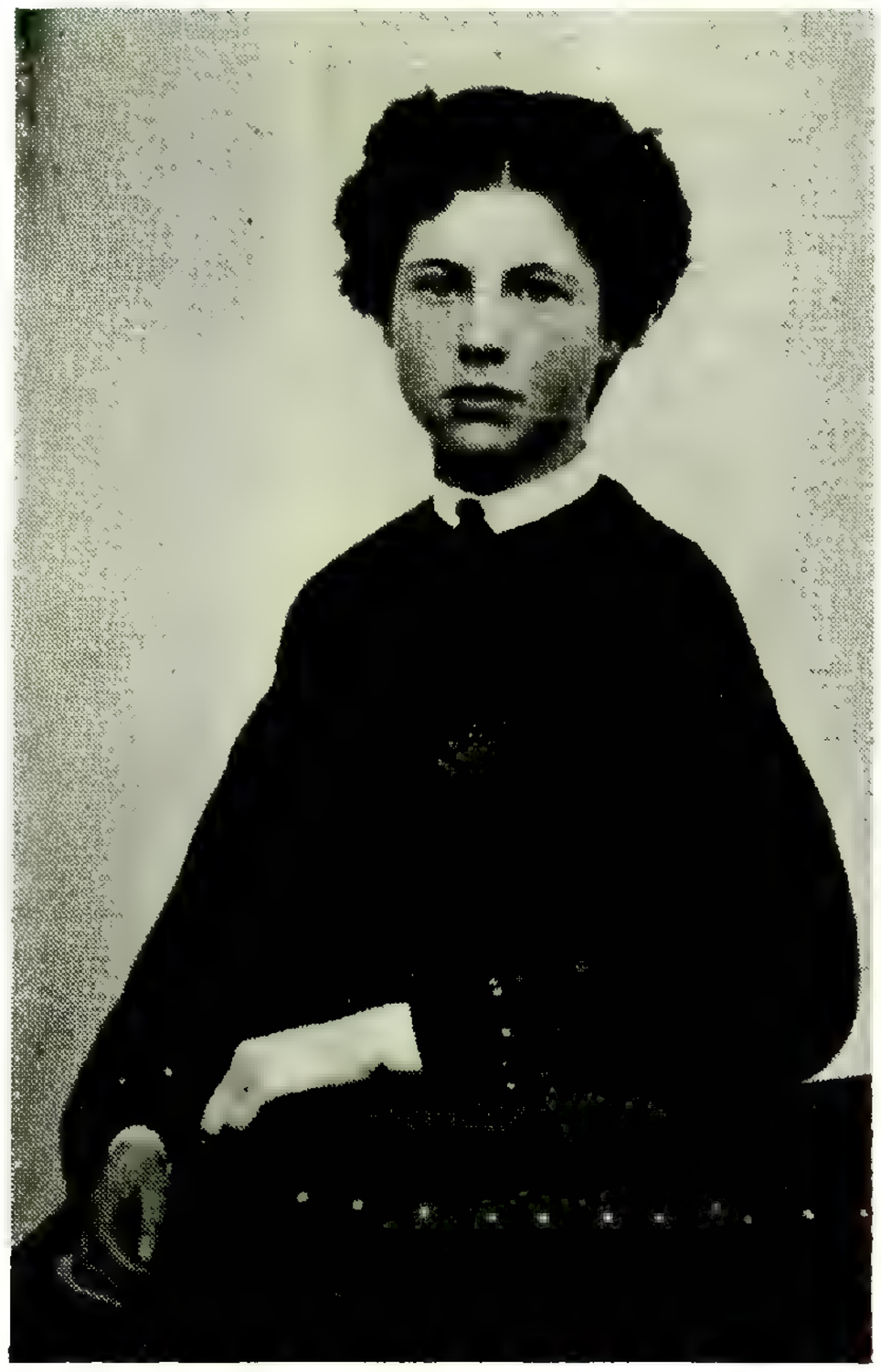
During his early years, his jobs were various; but because his home had been on farms and much of his work was farm labor he had always been with plants and animals, and his mind had dwelt on them. From his earliest years he had the greatest curiosity as to the behavior of plants. When he was fifteen, and for the first time was put

in charge of crops upon which he was at liberty to experiment, he began to make trials of various kinds. For example, he tried to improve the germination of corn by soaking the seed in various liquids, using test plots to compare results; and he attempted to grow a crop of wheat (which he had never seen) in a region where, for some reason, its cultivation had years before been dropped. He supposed that his tests were new, not knowing that experiments for the improvement of agriculture had been made through centuries. Always the tests were attempts to answer the questions that arose in his inquiring mind whenever he saw a crop of anything. But his coming to the Proctor farm, my mother's family home, must have given him his first thoughts on botany itself, on plants aside from agriculture.

My father's first introduction to the Proctor home came through my mother's younger brother, Fred, who asked if he could bring his chum, Nate, to dinner. My mother remembered the guest as very quiet, and "the family did not see much of him, for he looked only at his plate". At this time he was fourteen, and was helping his father, who was running a small farm, by caring for the animals. After the harvest was in, he was able to attend the winter term at Spencer High School, one of the three terms of the school year. At fifteen he cared for the grounds and horses of Mr. Charles N. Prouty, a prominent citizen, who kept a good stable; and there he had his board, and a comfortable room on the second floor of the barn. From this time on he had no home life and was self-supporting, though he was still

The house near Wire Village where Nathan Cobb lived when fourteen years old. This sketch was made by him on July 8, 1883, when he was teaching in Easthampton. It and a similar one in the book of Alice Proctor Cobb suggest that they were vacationing at the old Proctor home, with their year-old baby, and found time to sketch together again.

Nathan A. Cobb at about fourteen years, when he was six feet tall. The original is a tintype, in a frame of black walnut which he whittled for his mother.



Alice Vara Proctor at fourteen years.

going on eagerly with his scanty schooling, as shown by his perfect attendance record for the winter term.

At this time, when he was full of curiosity not only about the plants and animals that he worked with but about the things too small for him to see, he found in some magazine an advertisement of a microscope sold by N. Waldstein, New York City. Having very little knowledge of the business methods of the city, and knowing little or nothing about checks and money orders, he put into an envelope and mailed twenty-five precious dollar bills, a third of his year's cash earnings. I remember hearing my father say that he had always been thankful that the microscope came, not entirely because of itself, but because otherwise, unaware of his own business short-comings, his trust in the world would so early have been shaken.

TEACHER, 1876-1878

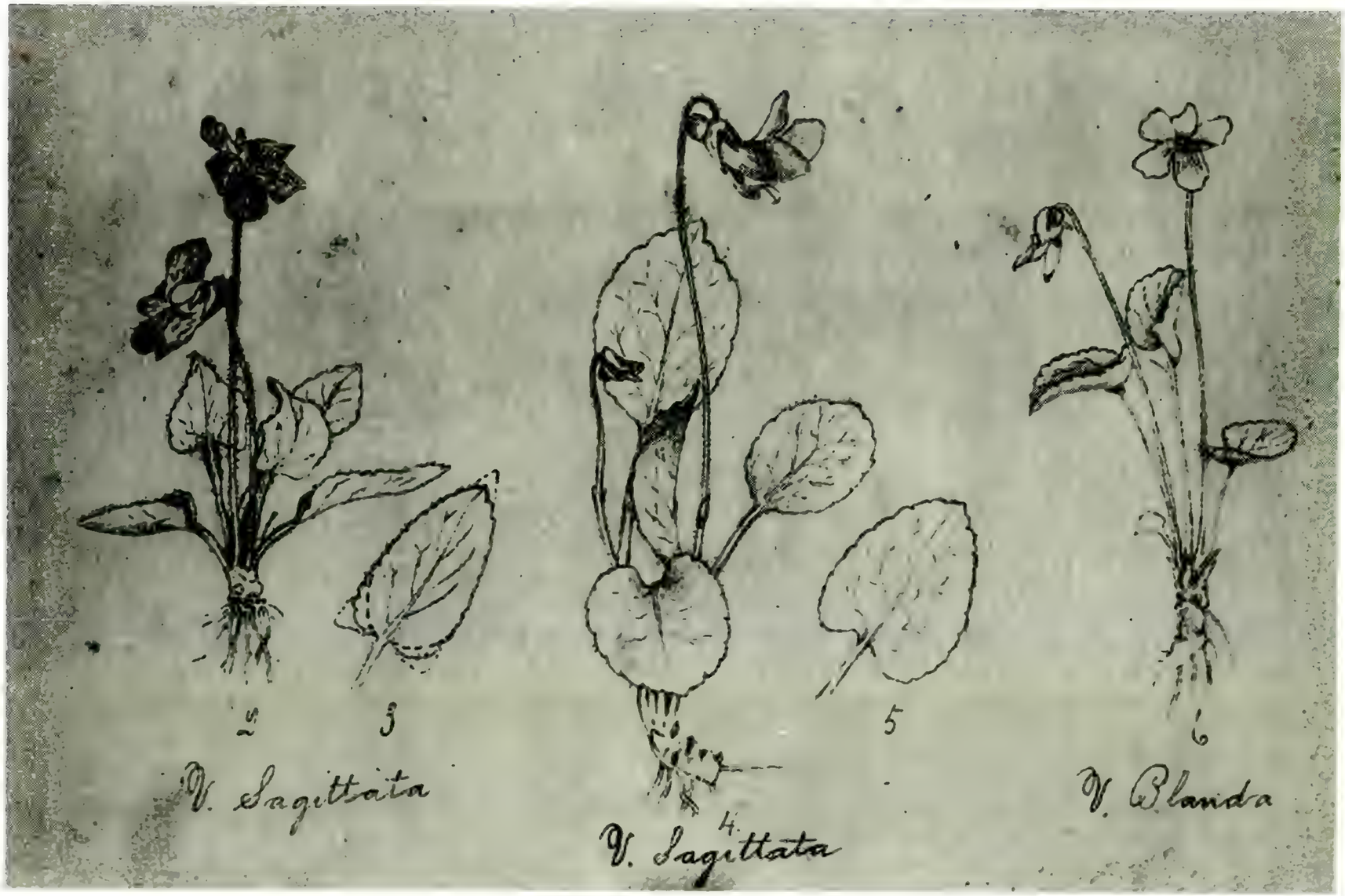
Soon Nathan Cobb began to teach Mr. Prouty's young children

about the things that he could see with his microscope. This may be what caused Mr. Prouty and a neighbor, who was a member of the town school committee, to encourage him to try the examination for teachers in the town's public schools. He passed, and at seventeen was assigned charge of the ungraded Wire Village school in Spencer, with an assistant. He had had no training as a teacher but must have made up for this by enthusiam, intelligence, and natural ability, for he was soon promoted to take charge of District No. 3 Grammar School, in the centre of the town, with another teacher under him. For his teaching in Spencer he was paid eleven dollars a week, and on this he began saving to go to college. Here, in 1877, he organized the first teachers' association of the town, and introduced into the curriculum what is now known as nature study.

In 1876, Fred Proctor had gone west to Nebraska, where his older half-brother was farming. This was a journey important in the destinies of my parents; for at Fred's request to his mother, his friend Nathan took over his room in the Proctor home and his chores on the farm, as he was doing also with Fred's position as teacher in the Wire Village school. During his two years of teaching, he lived with the Proctors; and even after he had gone to Worcester for his three years at Worcester "Tech", he came back to their farm for the summers. He got on well with my Grandpa Proctor; but especially between him and Grandma there grew a deep friendship.

In July, 1876, the year in which Nathan Cobb became a member of the Proctor household, Alice Proctor was graduated in the first class of the new normal school in Worcester. Her two fellow-graduates of the first class of the Spencer High School, Ella and Joseph Chauncey Lyford were also among the ten graduates. For the next five years she taught in Worcester, coming home (an eight mile buggy or sleigh ride) on week-ends. During these week-ends there must have been much for Alice and Nathan to talk about, for he was having his first teaching experience, and she was for the first time teaching with the benefit of a normal-school training, though she had taught for two years before going to normal school. And during the summer vacations (when house and farm work permitted) they were companions in botanizing, sketching and painting. On August 7, 1877 they became engaged, but were not married until four years later, August 8, 1881, when he had completed the course at Worcester Free Institute and accepted a teaching position.

There was another recreation in these years besides botanizing which was dear to them both — drawing and painting, a hobby which not only brought my parents together but also helped to lay the foundation, I believe, for the outstanding illustrations of my father's scientific



Page from a sketchbook of Nathan Cobb, in his late teens. Species of *Viola* named in accordance with Gray's Manual, probably the 5th edition. They would now probably be known as *Viola fimbriatula*, *V. sagittata* and *V. blanda*.

publications. When he was sixteen, and earning his living caring for the horses and grounds of Charles Prouty, both Nathan and Fred Proctor, who was then greatly interested in drawing, were attracted to the painting of another boy, Joe Greenwood. (Joe was to become the well known painter of New England scenery, J. H. Greenwood, and husband of Fred's younger sister, Lizzie). Nathan was so fascinated by Joe's work that he bought a box of oil paints and started painting. Soon he offered Alice his box provided she would use it. She had always had a keen interest in drawing, and he wanted her to paint, too. Her brother Fred took her to call on Joe, and they found him painting a card, which he gave her to finish. Thus she was launched into painting, and with my father's encouragement, she continued it, off and on as time and circumstances allowed, for the next twenty years. She took a few lessons; but the copied paintings done in class, as they later hung on our walls, did not appeal to her children as did the several "up country" scenes which she painted from nature in Australia. These are good work, and we treasure them. By the middle nineties the care of six children had pushed the pleasure of painting out of her life. Her pencil sketching had of necessity been given up earlier; the latest sketch I remember seeing was made at the Suez Canal on the way from Naples to Australia, in 1889.

But for my father, drawings and water colors became routine forms of scientific recording, and he sketched freely. In the days of his early biological work in Australia, little could be done photographically; so in choosing assistants for his work, he first of all made sure of a good team of illustrators, the very best available. He insisted on lavish illustrating of the highest possible quality in his published papers. I believe that the early companionship of my parents in their sketching and painting had given my father his first inkling of the value of these arts in scientific work.

Some of the old sketch-books from the four years of their engagement and the early years of their married life were among my mother's treasures to the end of her long life. In her last years, even when ninety-six years old, she would sit on her couch in my living room looking at them for hours at a time; and nothing pleased her more than having someone to sit beside her and admire them and to listen to the stories which went with the sketches. These sketch-books were her mementos; through all her years they had helped her to hold memories of her youth. Cameras then were only in studios for portraits; and no souvenir books of pictures cheaply reproduced from photographs could be bought. What my mother had as a reminder of the day they spent in the woods at Mad Brook, — or the birds' eggs they found during one summer, or her wonderful journey to Kennebunk, Maine, or the new kind of violet they found — was her own sketch-book.

When one draws, one looks, and sees; what my mother drew, she remembered. Now her grandchildren, at the same age, take for granted the marvels of color photography, and have their boxes of kodachrome slides to help them relive their auto trips west; but I wonder — can they see as much on our projection screen as their grandmother found in those little pencil sketches as she mused over them?

Mother's and father's sketch-books of these years are a good deal alike; often the same scene was drawn in the two books — of the view of the farm looking down from Howard's Hill; of the man mowing in the meadow, from only slightly different view-points; or of the same flowers or birds' eggs. Certainly they must generally have sketched together, and botanized together; and sketching was a part of botanizing. The dainty little drawings of wild flowers were done with sharp pencils and great care, and were labeled with the Latin names. And I believe that, though the interest was inherent, and he must inevitably have become a scientist, this was where my father's study of botany actually started.

A series of letters to his "brother-to-be, Fred", written when Nathan was eighteen, and teaching in Spencer, show the variety of his interests and duties. On December 9, 1877, he wrote: "I have 65 pupils in my 'academy' running from 11 to 18 years inclusive. I have 20 boys over 15 years of age, a tough lot, too — Irish from the boot shops. The boot manufactories are closed now and consequently these young peggers run in upon the 'man-teacher' in No. 3. . . In order to be contented in the school-room, scholars must have some new and attractive thing to catch their attention as soon as it is drawn from study. Last summer I paid no attention to this. But next summer, when flowers are plenty, the days will be few when my desk does not boast of something new in the way of 'blossoms'."

"Have been botanizing a little lately upon some western flowers which the folks brought home. Classed the 'blazing star'; also the 'sensitive pea.' Perhaps you didn't know that your beautiful yellow prairie flower, the sensitive pea (Wood) is nearly related to the famous 'sensitive plant', and is very slightly irritable by the touch. I am beginning to find that winter has interesting things for those who will brave him and walk out and observe. Last Saturday Allie and I went down the lane through the pasture and down by Mr. Ford's brook. Running water is not yet frozen. In the brook, under water, covering the entire bottom was a very curious structure. It consisted of small tubes, apparently made of mud, set very closely and rather firmly together. These were about 3 inches long and less than 1/16 of an inch in diameter, and, I should think, of animal make, though in poking about a good deal we discovered no sign of life. It is mysterious yet.

Am going down to see Mr. Kingsbury about it. By the way Mr. Kingsbury has been chosen member of the Natural History Society of Worcester, corresponding member. At the brook we also found some 'case-worms' or 'caddis-worms' as they are called. They are the larvae of an insect resembling the dragon-fly and pass the first two stages of development under water, emerging in a perfect state. They are called 'case-worms' because they make a case of some short pieces of straw and pass the second state of their existence within the case. Mr. Kingsbury showed us some once, I think. Those which he had [in] a bottle when we were down there one time early in the spring. Have lately found the way in which our common rock-moss reproduces, or rather I guessed at it and the microscope told me that I was right. Buy a Mike with the first moneys you have to spare. I never got rid of $25.00 to so much advantage before. Allie said that you remarked that 'Nate never could keep any money' when I got mine. Well it's about so. My supply is so low at the present time that I can't afford to subscribe for any periodical and shall have to be 'parsimonious' per necessitatem. I should like much to take the Popular Science."

On March 18, 1878 he wrote: "I shall teach in the same school next

View of the Edward Proctor farm, July 14, 1880, from the sketchbook of N. A. Cobb. The house with its ell is at the centre of the picture. At the left is the barn and next to it the shop that was used for leather tanning and currying. The road from Worcester to Spencer runs from lower right, between the shop and the house. The North Road, to Wire Village, branches off at the small elm tree in the triangle.

term. What are you doing now that school has finished? I am at work for Sike. . . I work 3 days per week for my board carpentering in his barn — raising a scaffold and making a set of horse stalls underneath, etc."

And the following month, April 29, "I have the permission of the school committee to use the high school building on Saturdays, and shall start a drawing school soon if I can get scholars enough." This he did, and taught it in the summer. Even then, before his courses in drawing taken at Worcester "Tech", he had learned enough, by himself, to undertake to teach it.

COLLEGE, 1878-1881

An ambition to go to Harvard University is shown in his letter of March 18, 1878, to Fred in Nebraska: "Have you decided where to go to school yet? Is it Harvard College? I hope so. If it is we'll go to school together yet. . . I have saved $175 this last year. Have in all about $230. I think I can go to school in one year from this time." (He went sooner than that — in winter of that year.)

But on July 28 of the same year he wrote: "The graduation exercises of the Worcester Normal School took place July 9. The entrance examination of the Technical School occurred the same day and so it happened that while Alice went to the former and while Lizzie went to Ada Rockwood's I went to the Technical School. The examination was easy, oral, and short. Passed for some months in advance and hope to enter the school at the end of next term (my school).

"I find, Fred, that it will take too long for me to prepare for college. I don't think I can afford to spend the time preparing for college which I can as well spend at some lower school studying nearly the same branches as would be taken up at college. The teachers at the Technical School cannot of course be compared with those at Harvard or Yale, but after all the teachers are not everything: if one is smart it will show anywhere; and if one is dull no amount of good teaching can make him sharp. Prof. Thompson of the Technical School is well known as a chemist and man of science. He is an excellent teacher and a man of good moral principles. All his students just about worship him. His school has graduated ten classes since 1867 and the students who have been a dishonor to the school have been remarkably few. The school has three courses, one in civil engineering, one in mechanical engineering, and one in chemistry. I intend to take as thoroughly as possible the first and last courses, civil engineering and

chemistry. Now here I would like your advice. You know I lean naturally to the natural sciences, not the physical. I care more to investigate the form and structure of plants and animals than to look into their chemical composition; but as each branch of science is dependent upon every other it is necessary to have a good knowledge of physical science in general in order to succeed in the natural sciences. Now my knowledge of chemistry amounts to this mark: 0. So I intend to study chemistry at the Technical School solely for the purpose of applying it to the natural sciences. But they use Barker's College Chemistry which work I have before me. It is divided into two parts viz: Part I Theoretical Chemistry, Part II Inorganic Chemistry. Now I want organic chemistry, what am I going to do? In point of expense the Technical School is the cheapest school that I can enter the tuition being free to the youth of Worcester County. There are no schools making a specialty of the natural sciences excepting the high priced colleges. I would rather take a thorough course in the natural sciences than any other, but lacking the means am obliged, for ought that I can see, to study mathematics and earn my living by the tripod, making the study of nature a pastime for leisure hours, when I would much rather study nature always and let mathematics go to grass. What shall I do?"

The remains of the first schoolhouse of the town of Spencer, Massachusetts. It was finally used as a wagon-shed. This sketch was made by Alice V. Proctor on May 1, 1879.

the weather instruments. He needed to live frugally, to get through his college years on his savings, and habitually ate in cheap restaurants or bought his own insufficient food. A professor told of seeing him on a windy, cold day standing in the snow and leaning against the trunk of a large tree, on the sheltered side, while he ate a supper of plain brown bread. He had wandered out to be alone, fearing discovery of his poverty. The poor living and the unsanitary condition of the cheap restaurants were blamed for a severe case of typhoid fever in his second year. Three months were lost, November, December and January; for a relapse followed the first attack. His mother went daily from Spencer to care for him, and his school-mates took turns staying with him at night, until he was well enough for his mother to take him home. He was discouraged by this setback in his work, and suggested quitting; but Alice Proctor encouraged and urged him to go on (and I don't doubt helped him financially, too, for she was teaching then — though she must still have had a debt to pay to her family for their help in financing her two-year course at Normal School). So at the end of the three year course, in 1881, he was graduated at the head of his class of about fifty on June 30, the day on which he became 22 years old.

As there was no biology taught at the Institute, my father specialized in chemistry, the most closely related available subject. He continued his botanical studies outside of school, probably mostly in the summers at the Proctor farm, and he accumulated a large herbarium. He excelled in mathematics, as well as chemistry, and his graduation thesis, entitled "Notes on Miller's System of Crystallography" was a demonstration of Miller's conclusions by analytical geometry instead of the spherical trigonometry used by Miller. The thesis was submitted to outside examiners, one of whom, Professor E. Dana, suggested submitting it for publication in the "Krystallographische Zeitung". A Worcester daily newspaper item on the examiners' report read: "It will excite no envy to repeat the praise that Judge Dewey gives to the extraordinary thesis on crystallography by Nathan A. Cobb, of Spencer. 'It appears to be the work of a teacher rather than a scholar. In his essay of 50 pages he gives many new demonstrations of his own. For patient and thorough investigation and perfect drawing of the diagrams, for a clear statement of propositions, intelligent definitions and demonstrations, the essay is to be highly commended, and may be preserved for its usefulness and value and as an evidence of what can be accomplished by a student at the Institute.' We are informed that the opinion of the examiner is more than sustained by high scientific authority."

The examiner of the graduating class of most importance, from the point of view of Nathan Cobb's career, was the president of Williston

Seminary. He attended the commencement exercises and heard the delivery of the abstract of the thesis and the presentation to my father of a Salisbury prize, one of six given each year to members of the graduating class with highest scholarship. There was a vacancy at Williston then, and the position of teacher of chemistry and drawing was offered to and accepted by my father.

EASTHAMPTON, 1881-1887

What other positions my father considered when he was graduated in 1881 I do not know; but his acceptance of the position of teacher of chemistry and drawing at Williston Seminary must have been a fortunate choice. Here, in congenial surroundings, in an area of abundant material, he was able to go on with his self-education, his studies of plants and animals. Had he joined the faculty of a school of narrower vision or one in a city, his scientific career would perhaps never have developed so fully.

Williston Seminary was founded in 1841 by Samuel Williston, the son of a minister, who had been forced by failing eyesight to give up his ambition to study for the ministry. He became a successful business man, but kept his devotion to church, charity and education, giving his wealth away as fast as he earned it. As "a pioneer in manufacturing, he foresaw needs not then generally felt and had the imaginative enterprise and the organizing ability to devise profitable ways of supplying those needs before others were awake to them.

"In similar manner when this man turned his mind to education his sturdy independence and keen insight refused to be satisfied with schools as they were. Greek and Latin, then almost the only subjects in the course, were necessary studies for embryo ministers, and his school should give an unsurpassed training in them; but not all students were to become ministers and education in other directions was sorely needed. His prophetic mind foresaw, what fifty years later was clear to everyone, that alongside the classical education and holding equal rank with it there should go an English education made up of English, science, mathematics, history, modern languages. At the time, this was a startling innovation, if not rank heresy; but Samuel Williston was no slave to tradition, he had already departed from it in daring ways and he had faith in this new vision. In the end the vision triumphed."[1]

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[1]In 1929, Principal Galbraith of Williston Academy (formerly the Seminary) gave to the Sunday gathering of the school a talk on Samuel Williston which was published in the Williston Bulletin Vol. XV, No. 1, Dec. 1929. From it these paragraphs are quoted.

So Williston Seminary was founded with "a classical and a scientific department, existing on a parity with each other," as stated in the catalog of 1878, which explains that "the work of our scientific department is by no means limited to preparation for the scientific schools at Harvard and Yale and elsewhere. Extending beyond this, it provides fully for the needs of those who do not intend to add a special or technical education to the general education furnished here".

Though in the first year my father's duties were the teaching of chemistry and drawing (including assisting in the field work of the senior class in practical surveying), he was soon given charge of nearly all the natural science work as well — zoology, physiology, botany, each one term for the second year students; chemistry, chemistry with laboratory, and geology for the fourth year students; and drawing for the second, third and fourth years. According to the catalog he inherited a rather comprehensive program of drawing: second year — freehand, outline and perspective drawing; third year — drawing from models, geometrical drawing and projections; fourth year — architectural drawing, mechanical drawing, plotting and topography.

At his instigation, the laboratory equipment was increased and improved. For physics and chemistry, better work-tables and stools and probably apparatus were provided; and for a new biology laboratory, enough microscopes were bought to supply the classes. Though we have no record of this, we "have always known" that our father, hearing that new teaching laboratories were being installed at Harvard, took a trip to Cambridge, and brought back ideas for setting up a biology laboratory at Williston. So in 1885 appears a novelty in the catalog of a secondary school: "A new natural science laboratory is at the service of pupils in zoology and botany ." Williston thus became one of the first secondary schools in the country, if not the first, to have a compound and a dissecting microscope for each member of the class. Direct experience was always stressed by my father. (Years later, he used to tell his children to go about their studies "thing-end first"; in fact he did not give us books at all, but magnifying glasses, and microscopes.) It is not surprising that during the time he was in charge of the natural sciences at Williston, several significant words were added to the printed curriculum in the catalog of the school: to zoology, "with laboratory practice"; to physiology, "with laboratory practice"; to botany, "with laboratory practice and excursions"; to geology, "with excursions".

But even here this science teacher sometimes had to campaign to maintain his educational standards. From some quarter there was criticism of the laboratories on account of expense. The chemistry

laboratory was suspected of adding unduly to the gas bills of the Seminary. One page in his "Annual Report to the Principal from the Department of Natural Science and Drawing (1883-4)" gives the readings of a gas metre at three o'clock and again at five o'clock (evidently the class period) on Monday, Tuesday, Thursday and Friday, for a three month period, with the total used, 445 cubic feet, and the cost, $1.56 for the three months! — I remember hearing that story. My father tried all methods of impressing economy on the boys, including the posting of numerous signs: "Turn off the gas when you are not using it!" This was harped upon so much that the pupils became amused and took it up as a slogan. Two boys chatting on the campus would part with a cheerful: "Well, turn off the gas when you're not using it!"

Doubtless the boys liked him as a teacher; young people with whom he worked were generally very fond of him. After leaving Williston he was so long abroad that he lost touch with his pupils there. Forty years later, in 1925, he had a letter from Dr. Richard E. Dickson, a member of Williston '86, a successful physician, who happened to learn his whereabouts and wrote: "I'm very glad to write you after the many years since I last saw you, thanking you for giving me the many lifts you handed me, resulting in much better scholarship than I started on the first year at W. S., as well as a different viewpoint later on. Getting me waked up and at work by a few lines to my father at the end of the Junior Middle year to the effect that I had next to the highest marks in the class, and you hoped I would continue to, roused my pride sufficiently to make me work, and thanks to Billy Parsons of Southampton being too bashful to stay his senior year and graduate, when he would have taken the scientific oration, I got that, and you and I tramped all over the valley looking for red sandstone outcropping, etc., to my lasting benefit. After that you went across to get your degree, and I went to work to get cash enough to secure further education." On closing the long letter: "I've drawn this our unduly, but with the purpose of emphasizing the fact that if my good friend Cobb hadn't helped me a whole lot to think and get started way back in those mid-teen days at Williston, this whole story would undoubtedly have been quite different, and so again thank you for hitting me up, and getting me interested."

I like to think of my parents' six years in Easthampton, a quiet little Massachusetts town in a beautiful part of the Connecticut River Valley. The area was noted as well for its cultural atmosphere, with several well-known colleges clustered close by —Amherst College and State Agricultural College at Amherst, eleven miles off; Mt. Holyoke Female Seminary at South Hadley, seven miles south; and Smith College, and Clark Institute for Deafmutes, at Northampton,

The laboratory in the Easthampton home. The room adjoining was the tool shop.

four miles north. Otherwise it was a community not very different from the one in which they had always lived, and close enough to it (a journey of about a hundred miles) so that they could occasionally go home. They were in a friendly group of fellow teachers, and lived comfortably and simply, without pretension. Though their salary was not large (starting at $800, it was increased yearly until at the end of the six years it was $1700) they were able to provide for their needs and save for a year at a university. It must have been a peaceful and contented time, in the home which they had so well earned. The first four of their seven babies were born here. But their happiness was shattered by one of the two great griefs of their lives: the death of their first child, Russell, when he was nearly two years old, shortly before the birth of the second.

Here my father engaged in a good deal of outside study. He had a laboratory in his home and made chemical analyses of water, paper, beer, and other things[1] for manufacturers in neighboring towns, business men and private citizens, which helped to piece out his salary. His study of biology went on steadily here. That of course must have been necessary for his teaching, as he had never had a school course in botany or zoology; but he studied much further, for his own satisfaction, always with the thought of going back to school for a higher degree. He did so much in fact, so carefully, that without any previous school training in the natural sciences, he was able to earn his doctor's degree at the University of Jena in ten months — his only period of formal study of biology; and he passed the examination in geology without attending any lectures, from his own experience in Easthampton.

During his years in Easthampton he was occasionally in correspondence with Asa Gray, who had kindly advised him in his work since 1878, when he had sent Gray some specimens of interest. Leo Lesquereux took interest in his moss studies, and lent him some valuable books on this subject. His study of mosses must have been extensive, for he collected a large herbarium, bought Sullivant's *Icones Muscorum* and other standard works, and added several species to the known moss flora of the region. Here, too, he prepared his first publication: "A List of Plants Found Growing Wild Within Thirty Miles of Amherst".

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[1]According to one of his printed advertisements, these "other things" included tea, coffee, cocoa, starch, flour, butter, cheese, vinegar, soap, chloride of lime, gunpowder, guano, super-phosphates, urine, milk, all alcoholic liquors, iron, steel, boiler scale, soils and manures!

SOJOURN IN EUROPE, 1887-1889

All this time my father was looking forward to higher formal education. At the end of five years, he proposed to resign to carry out this ambition. But at that time there was to be a change of presidents at the school and he was especially asked to stay for another year if possible. This he did, and as a result became ineligible, by being a few months too old (he had turned twenty eight), for a fellowship for which he applied at Johns Hopkins University. Why he then chose to go to Germany I never thought to ask, though of course he was attracted by Haeckel and Hertwig. My parents set out for Jena in August 1887, with three little children aged three and a half, nearly two, and the baby two months old on the day they sailed from New York. They had only their savings of the past six years (about $1,000 I believe) increased by $700 lent them for their venture by an old friend who had confidence in them, Mr. Prouty of Spencer.

Once I sat at my typewriter and as my mother talked, giving me a brief account of some of the high spots in their early life, I made notes, intending sometime to write from them a finished story. The paragraphs following, from my notes, are practically in her words, — which, though sketchy, I now like better than anything I could write. She was then about ninety years old, but remembered clearly, as she always had, the dates and details of the family's doings. My father used to say that he had never needed to keep a diary -- she could remember it all. I have heard him laugh over experiences that he had quite forgotten until he heard her relate them.

"Nathan had majored in chemistry at Tech, but felt that such rapid progress had been made in chemistry in the six years since then that, though he had been teaching it, it would be hard to qualify for an oral examination". This seems to me perhaps a rationalization to justify slipping over into the field which had always been his choice but had been denied him by circumstances!

"Sailed from New York Sept. 28, 1887, on the 'Westernland', Red Star Line, second class. Nine day trip, fare forty dollars each (none for the three little children). Landed at Antwerp, and stayed there three days — just before the fires in the hotel begun by date instead of by weather were started. The children had to keep their coats on. A pitcher of hot water for the baby was the only warmth. Baby Roger slept in a trunk, on the clothing, Margaret on a couch, Victor between his parents.

"On the way to Jena, stayed at Cologne for two nights and a day, the first day of sunshine. Left the babies with the chambermaid in

N. A. Cobb immediately following his student days in Germany. The photograph, a tintype, was taken April 5, 1889, after he reached Australia.

the afternoon, and spent part of the half day in the cathedral and part in the art gallery, where we saw the painting 'Queen Louise'. At Jena, went to 'The Three Bears' inn for eight days — time to find a house and a maid. Took the second floor of a new villa, seven rooms, rent 400 marks (100 dollars) per year. Stayed ten months. Intended to return to U. S. A. at end of year, planning to get the degree in that time. At University by middle of October; in March, five months later, Nathan was told he might begin his *Arbeit* ; five months more, and he rented a dress suit from a waiter at 'The Three Bears', bought white kid gloves, and took the oral examination".

Thus, with attendance at set school courses for only about seven years of his life (four years between high school and Ph. D.) Nathan Cobb secured the degree for which usually twice or thrice that amount of attendance is accorded. As he said, his education was to an unusual degree through contact with men and things.

My mother's notes continue: "Two months vacation between finishing at Jena and starting four-month appointment to the Table of the British Association at Naples. A toss-up between Munich (where an art exhibition was in progress) and Freiburg. Tossed a coin and went to Munich for two months. The children had whooping cough for the whole stay. No laboratory here." (My father has mentioned his "free use of the hospitality of the professors at the University of Munich.") "Visited art gallery, Wagner Theater, etc.

"Left for Naples with a lunch basket containing rye bread, butter, cream cheese, bottles of cocoa (and material for making more, and a

cream cheese, bottles of cocoa (and material for making more, and a spirit lamp), and a roast goose (boned) — the one which fell from the second floor window-sill, where it had been set to cool, to the stone-paved court below. Two nights on the train. Baby put for naps on coats in the baggage rack. In a rooming house in Naples took one large room, fourth floor, overlooking the Bay of Naples with Mt. Vesuvius in view. House against a steep hill, so all were front rooms; street on level with tops of houses of next street below. Each room had one pair of big glass folding French doors, the only windows, which opened onto separate stone balconies with iron railing, about six feet long and two feet wide, where the children played. All market produce bought over the balcony, by letting down a basket. Donkeys came with panniers (hard to see the donkey) or sometimes a two-wheeled cart. Children said 'Come and see what this donkey has to sell!' Milk from goats, milked on the spot, was half froth. Did not like it, so used canned milk entirely. All 'butter' was margarine, so used olive oil instead, on toasted bread." (They never got over this habit, and olive oil was always on our table; some of us still use it on our toast.) "The room was large enough to keep the trunks in one corner. Had a washstand where the children's small clothes were washed. There were fleas in the room. The three children slept in the double bed; parents in single beds on either side, to prevent the children falling out. Had use of one grate of the charcoal 'stove' of yellow tile in the kitchen; able to prepare only two dishes for each meal. Saw a woman cook an octopus there. 'Everything that comes out of the Bay of Naples is good to eat', so Nathan got me to try cooking *Amphioxus* . Mountain water running perpetually in kitchen— the only convenience.

"Landlord was a well-educated Dutch M. D.; his wife, Italian, also 'educated' — i.e. could read and write when seventy percent could not. One Sunday they took care of the children, while the parents went to Pompeii. Nathan climbed Vesuvius, in eruption, and saw a man's stiff coat tail taken off by a falling red-hot rock, as he bent forward to avoid it. Only once took all the children down from the fourth floor to the pavement. Baby, who ran about upstairs, sat down on the pavement and would not walk; had to be carried to the Biological Station."

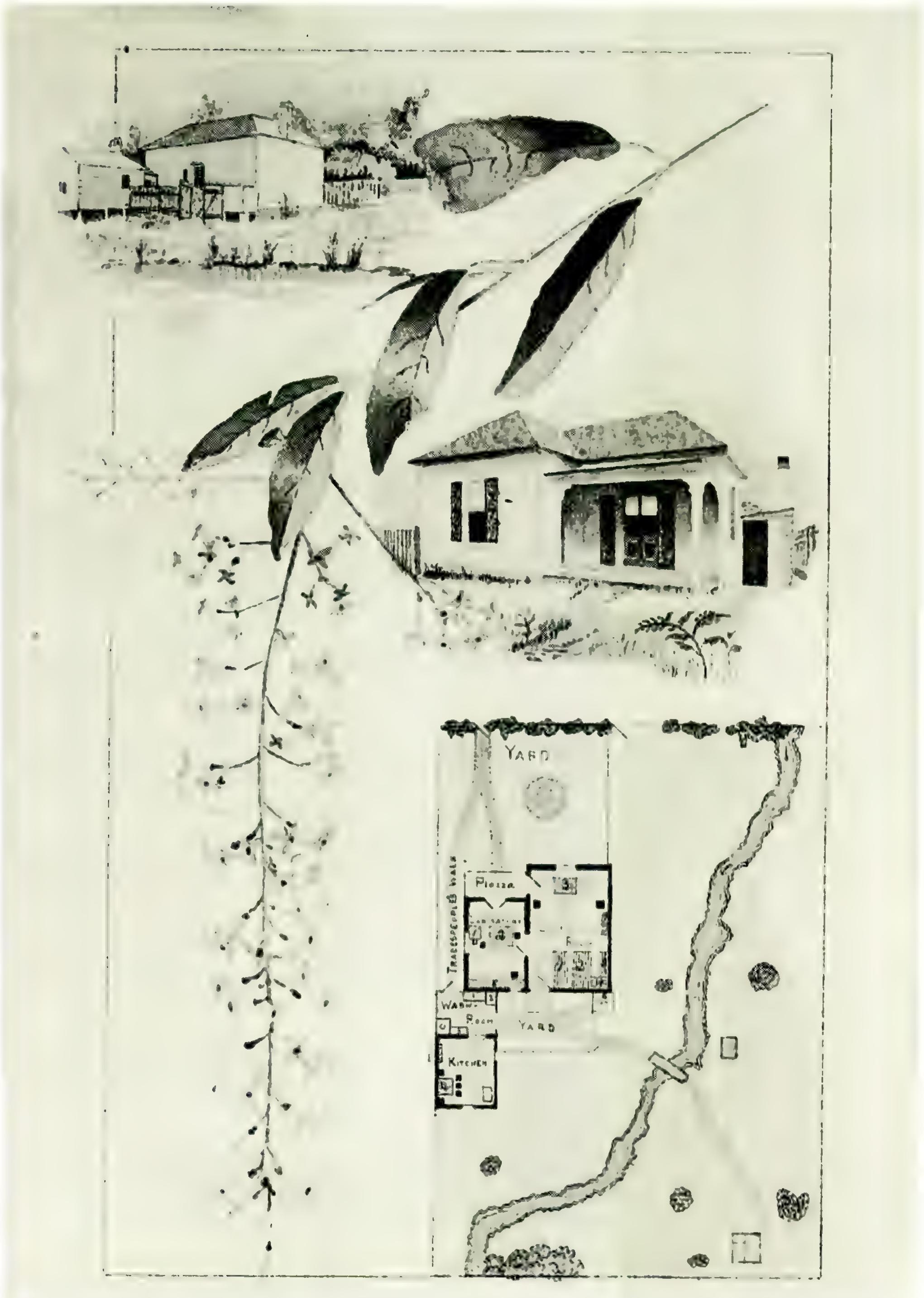
Though in the year and a half in Europe his work was more zoological than botanical, in the ten months at Jena my father had taken work in botany under Stahl and done some work on fungi. At the Naples Station the work was of course entirely on the marine fauna.

OFF TO AUSTRALIA, 1889

When the time came to leave Naples, temptation was too strong for my father: it might never again be so convenient to go to Australia, the biological wonderland! There was money enough to get there; no farther. They talked it over. My mother was ready to try whatever seemed best to him. Whenever later someone exclaimed at her courage in moving her rather large family all the way around the world, and half way around twice again, in those days of uncomfortable traveling, she always asserted that she had no courage at all; that all she did was on the strength of her husband's. However, she also was a good pioneer. So they paid eighty-one pounds for tickets for the 39 day voyage to Australia and sailed on the S.S. *Iberia*, Orient Line, on Jan. 28, 1889. My father warned my mother that hard times might be ahead; that they might have to eat from a barrel-top. She told us that they never did, but added that she did see the time when she would have been glad of one to eat from!

"Took tickets to Sydney", my mother continued, "not because there was any particular objective there, but because the fare was the same as to the nearer city of Melbourne. Nathan left the boat at Adelaide and went by rail to Melbourne, in order to have time for interviews to determine whether to remain there or to continue with the boat to Sydney. He had a letter of introduction from Ernst Haeckel to Baron Ferdinand von Mueller, Victoria State Botanist. The latter knew of no opening in Victoria, but gave letters to men in Sydney, where the re-united family arrived on March 7. The American Consul gave names of American business men there, among them an importer, a Mr. Chipman. After Nathan had hunted a position in Sydney every day for four weeks, he went to Chipman who gave him the job of advertising a shipment of St. Jacob's oil, Waterbury watches and Colgate's Cashmere Bouquet soap, which had just come in." With this assurance of $25 a week, for a while at least, he counted what he had left---forty dollars.

Having a good share of Barnumism in his nature, he had the shipment sold in record-breaking time, so that another was ordered at once. For the St. Jacob's oil, he secured testimonials which he used in advertising. For the soap, he made chemical analyses of all the competing soaps in Sydney and was able to advertise with a clear conscience "none purer". For the Waterbury watches, there was spectacular advertising. Striking displays were made in store windows; in one, a huge watch was designed, made up of Waterbury watches, and in another a Waterbury was shown running in a tumbler-ful of water (and replaced when it stopped!). The first full-page advertisement to appear in a Sydney newspaper was made up of a



Reproduction of a water-color of "Monadnock" done by N. A. Cobb between 1889 and 1892. This was his first Australian home. After three years, when there were five little children, it was possible to have a larger home, in which the last was born.

woodcut of the Waterbury factory as centre piece, with a long murder-mystery-love story in which the hero, who would seem by circumstances to be the culprit, was saved from prison by the evidence of his Waterbury, which had fallen from his pocket while he was boating, been swallowed by a fish, which in turn was eaten by a shark, and finally the watch was found still going when the shark was captured! The full page advertisement was turned down by one morning paper, because such a thing was unheard of. So it was offered to the rival daily, with the previous refusal used as an argument, and was taken.

For about a year my father worked for the importer. At the same time he did odd jobs for a publisher such as traveling for a series entitled "Picturesque Australia" and criticizing and comparing school books, with the help of his wife in her "spare time" (with three little children and soon the first of their three Australian babies, who was born during this year). And in addition to these jobs, the young Ph.D. started working on a six months' appointment by the New South Wales government as Consulting Pathologist of the newly formed Department of Agriculture. He was to give enough time, mostly evenings, to answer letters from farmers, examine specimens, etc., and was paid two pounds a week; but soon found that he put in much more time than the salary paid for. Thus he came to hold a professional position as botanist.

At the end of the half year's temporary government appointment, Dr. N. A. Cobb accepted the position of Vegetable Pathologist, and became the senior scientist of the New South Wales Department of Agriculture, the position which he held until his resignation in 1905. When he was finally leaving Australia for good, in 1905, an administrative officer asked him if he knew why his first appointment had been temporary. He had never wondered. Then he was told that it was to give them time to write to Easthampton, to find out why, with his family of little ones he had come to Australia. Of course it was then well past the convict days; but Australia was still far away -- a safe distance, perhaps! They wondered.

In 1891, he held for a semester the position of professor of biology at Sydney University during the leave of absence of Professor Haswell (co-author of the Parker and Haswell textbook of zoology) of whose courses he took charge.

For the first three years in Australia the growing family lived at "Monadnock," the little house shown in reproduction of my father's water color sketch. The plan shows the "living room" which was also sleeping room for the parents and their three (to five) babies,

and the laboratory, which were in the masonry part of the house. Behind this, and reached only by going outdoors, was the low, rather rough little "wash-house and kitchen" shed; and leading from this, a little frame unit on piles, the dining room.

At the back of the house (upper view) was the iron ship's tank, holding the household's water supply (rainwater) in which occasionally a tree frog was found -- which purified the water, the landlord said. Drinking water was brought from the well of his house next door. From this time on, for as long as the family was in Australia, (about thirteen years) all the drinking water was boiled, and cooled without benefit of refrigerator or ice.

The spray of *Buddleja* was from the hedge along the front fence.

The houses here were given names instead of numbers, often an aboriginal word, otherwise generally a good old English name. When Dr. Goodale, Harvard Botanist, who on his visit to Australia carried an introduction from Asa Gray to my father, strolled along our street in North Sydney looking for some sign by which to guess the right house, he came upon this cottage called "Monadnock", and knew he had found it. -- My parents had become engaged on the top of Mt. Monadnock.

PLANT PATHOLOGIST, 1890-1898

As the bibliography shows, the duties of the first official full time Plant Pathologist in Australia were wider than the title would suggest: work not only with fungus diseases of all kinds of plants, as well as diseases those caused by nemas, but also with the nematodes themselves; studies of parasites of animals - nematode, tapeworm and fluke; studies of wheat, not only its diseases, but the qualities of different varieties, their improvement by selection, their nomenclature, the grain itself, the handling of grain in commerce and the wheat industry in general. A rather diversified program, it seems now. He answered letters from farmers and stockmen, studied and experimented with the serious diseases of plants and animals at the government experiment farms and at temporary laboratories on ranches, and published numerous papers on the results of his research for the benefit of farmers and the use of scientists. His office was in Sydney, but he did a great deal of field work, and made many brief trips of a few hundred miles. For two years, 1897-98, he managed the Government Experimental Farm at Wagga Wagga, three hundred miles from Sydney, and spent many nights on the train - to the farm for a day or two, a night trip down to Sydney for a day in the office, and back to the farm again

during the night.

In all this work the Doctor, as he was generally known, was given a very free hand. He had full responsibility for the scientific work on the problems that he undertook, and largely for the whole program of his office. He was under officers of administration only; in the management of his research he was entirely free.

From the inception of the Department of Agriculture until my father's absence from the Colony in 1898, he had charge of the wheat work of the Department, and personally directed the hundreds of wheat experiments at the Wagga Wagga Experimental Farm, where the total area in the seed wheat studies reached some seven hundred acres.

In 1892, an Intercolonial Conference on Grain Rust was called, and he acted on most of its important committees during nearly all the years of its existence, no member contributing more to the

The kitchen at "Monadnock", marked "washroom" in the plan. There was of course no refrigeration. Half a dozen eggs, extravagantly bought in the "off season" from laying, when each egg cost as much as did a pound of mutton chops, were so carefully hoarded here that four of them spoiled.

The pathologist, about 1891 or 2 in a veranda laboratory near Queanbeyan.

N. A. Cobb nearing forty years (about 1897).

published reports of the Conference. As chairman of the committee on nomenclature he directed its efforts, more particularly in New South Wales. When he began working on rust of wheat, the nomenclature of the varieties in cultivation was in chaos. Half a dozen wheats differing materially from each other could be bought under the same name. And a drill of wheat only twelve feet long might contain five different sorts. In some instances the mixture was so bad that it was impossible to decide which plants deserved the name under which the sample was procured. Not only was the same name applied to several totally distinct kinds of wheat, but the same wheat was known under several different names.

By careful examinations and measurements, made in part with a microscope in the field (often in blazing heat all day) and in part in the laboratory, he reduced the confused nomenclature to some sort of order, to the great benefit of the wheat breeder and the farmer, who were enabled to identify varieties. More than a third of a century later, S. T. Pridham, wrote in *The Agricultural Gazette of New South Wales* (June 1, 1928): "In 1892, Dr. N. A. Cobb (now Nematologist to the United States Department of Agriculture) was Plant Pathologist to the New South Wales Department of Agriculture, and as such attended an Intercolonial Rust-in-Wheat Conference held in Adelaide in that year. At that conference, a committee to deal with the nomenclature of wheats was formed, and Dr. Cobb was appointed chairman.

"A report of his, written in January of the following year, has recently come under notice, which throws an interesting light on the

recently come under notice, which throws an interesting light on the beginnings of wheat breeding and selection work by the Department of Agriculture.

"Work was commenced in 1892, when a large collection of wheats was grown by the late Mr. William Farrer, at Lambrigg, at the instance of this committee. Actually 546 samples of wheat obtained from prominent seedsmen, well-known farmers, and Government departments were grown in short rows with the object of finding out and describing the number of distinct varieties amongst them, and also of selecting plants with rust resisting qualities for breeding work.

"The report finally recommends that 'it is the duty of the Government experiment farms to raise and supply pure seed true to name'.'

"The excellent position which is found in this State today with regard to the nomenclature and purity of seed wheat is largely due to the prompt action taken by the Department, and to its subsequent efforts to lay the foundation for pure seed production.

Although concerned with these matters of nomenclature, my father at the same time continuously studied and sought control of rust, the most serious disease of wheat. Not only was the rust itself fought, on the varieties in use, but by cross-fertilization and selection new rust-resistant varieties were obtained. This, of course, was before the rediscovery of Mendelism, and was one of the earliest attempts to breed rust-resistant varieties of wheat by hybridization and selection.

INTERIM IN THE UNITED STATES AND EUROPE 1898-1900

In 1897 Nathan Cobb proposed to resign his position in New South Wales in order to visit other countries to refresh himself by observation and, by contact with scientific men in Europe and America, to bring himself more closely in touch with the progress of science than was possible in Australia. There was reluctance to accept his resignation. For his purpose he needed two or three years. As there was no provision in the Public Service Act for so lengthy a leave, cabinet action was taken to appoint him half-time Special Commissioner to report on agriculture and other industries of America and Europe, for two and a half years, and to re-appoint him, in advance, to his former position in the Department of Agriculture. So in May, 1898, we all eight sailed for "home" (Massachusetts), a month-long trip.

During the two and a half years his studies were various, and his travels extensive -- to all the states in the Union, Alaska, western Europe and Algeria. He attended agricultural congresses, visited universities, inspected agricultural experimental stations, studied dairying and cooperative farming in Denmark, the contral of the gipsy-moth in New England, date growing in Algeria, road making, barns, all kinds of crops and farming, and above all, wherever he went, the wheat industry, with a special study of the handling of wheat on our Pacific coast.

He left his family in Worcester, Massachusetts, while he carried out his plan of travel in the United States, coming home to us from time to time. We children lost the chance of a year of study in schools of Germany or France, which had been planned, by coming down with all the children's diseases (we had had only chicken pox in Australia), sometimes all six of us together, sometimes stringing it out, a few at a time. Finally, when what looked like a clearing ahead was abruptly ended by the broken leg of the youngest, he went off alone to Europe. However, I think we all felt that nothing could have been better than the two years in Massachusetts.

AGAIN IN NEW SOUTH WALES, 1901-05

The first of the Australian babies was probably three or four years old at the time of this photograph.

No aspect of wheat or the wheat industry failed to interest my father and to get his attention. In 1901, when he returned to Australia, he published several long papers on wheat: "Universal Nomenclature", the longest and last, of seventy five pages; "Grain Elevators", a paper of about fifty pages, with over 50 original illustrations; and his beautifully illustrated "The California Wheat Industry" of thirty-two pages. After reading the latter, E. S. Wickson, Professor of Practical Agriculture at the University of California wrote: "I cannot refrain from expressing my admiration of the writing you are doing in the Agricultural Gazette. It seems to me the description of our harvesting and other arrangements for handling grain have never been approached for clearness and accuracy. In fact I believe the people operating the machines would learn very much from your description of them. I am also interested in your study of the wheat grain, and trust you may meet with some satisfactory response

to your pertinent suggestions."

In Australia in those days wheat was handled in sacks. While in charge of the Wagga Wagga Experimental Farm, my father had put up a grain elevator to show the manner of bulk handling; but it was ridiculed and called "Cobb's Folly". On returning to Australia after studying the wheat industry in the United States and Europe, he more than ever urged bulk handling, but without avail. Finally he left Australia for good with the prophecy that he would give them twenty years to change their method. But the change started before that:: in fifteen years it came, when during World War I sacks of wheat were dumped on railway platforms and docks faster than they could be transported. By the time the sacks were picked up, their contents ran out through rat and mouse holes -- or "ran away on many sets of four little legs." That lesson was enough to start action.

His most comprehensive wheat paper of this period was his "Universal Nomenclature of Wheat". In studying the commercial varieties to revise the nomenclature, my father not only considered the life history and aspect of the plant, but studied exhaustively the grain of each sample: its size, shape, weight, hardness, color, thickness of bran, internal structure, aleurone layer, gluten content, milling qualities, food value, etc. This required years of patient dissection of the grain under magnification, manipulations of its parts, examinations by microscope, chemical analyses, and delicate weighings. Hundreds of samples were compared in this way. Thus not only was a "house-cleaning" in the nomenclature of varieties accomplished, but correlations of characters were noted through which it became possible to predict commercial value by the appearance of a small sample of the grain, without growing quantities large enough for field and milling tests.

Extensive comparisons of internal structure of the grain of many commercial wheats showed that in the aleurone layer there is a striking variation in the ratio of cell cavity to cell wall. In some varieties the cells of the aleurone layer are small, in others large; in some the walls are thick, in others, thin. It was found too that wheats known from their analyses to be rich in protein (largely gluten) had also an aleurone layer composed of large cells with thin walls--though the gluten does not occur in the aleurone layer but is derived from the protoplasm of the flour cells in the interior of the grain. This correlation gave a method, easier than chemical analysis, for estimating from a sample the probable "strength" of flour producible from any variety or hybrid of wheat.

To estimate the comparative amounts of cell wall and cell cavity in the aleurone layer, a piece of the layer was prepared (and a simple technique for this was devised), mounted in carbolic acid for clearing, and photographed with a magnification of 100 diameters. The negative so made was projected to a magnification of about 1500 diameters with the image caught on stout, translucent tissue paper placed on a glass screen. The outlines of the cells and cell cavities were traced on the sheet of paper, which was about thirty inches square. I can remember seeing the cells being traced on the paper over the big glass screen in the projection gallery (a boarded-in, large upper balcony of our home); but, for good reason, I remember the next step more vividly. With a scratch or retouching tool (like a pencil with the lead replaced by a sharpened steel) the inner cell wall lines were cut, releasing the paper "cell cavites" (55% to 70% of the paper area) and leaving a network of paper "cell walls" ; and the weights of the two were then compared. The cutting was our job.

After school we four girls sat around the all-purpose dining table, with its smooth, natural wood top, each with an "aleurone layer" and a soup plate in front of her, and a tool in hand. Though we did not know just why, there was something tremendously important, almost sacred, about the aleurone layer. The breeze was shut out of the room; if one "cell" accidentally was lost, or blown into the wrong plate, probably our father's scientific career would be wrecked -- or, anyway, we would have failed him and he would be disappointed in us, an equally great calamity. We could not always do a whole sheet at a sitting. Those in process, as well as those done, were carried with utmost care and laid on the beds of the secluded guest-room. I don't know how many aleurone layers were studied, how many score of these sheets the four girls cut, nor how many weeks they lasted as a daily chore--perhaps not so many as my memory tells me. In his publication my father wrote: "This method gave greater speed, insured greater accuracy, and gave a chance to introduce lower-priced labor, and is the best that I have so far been able to devise for the purpose." The "lower priced labor", I remember, got threepence a sheet.

The "Universal Nomenclature of Wheat", with its five-page index of about a thousand entries, reminds me of another routine job that fell to the children. We remember well how our father's indexes were put together, our eagerness to make speed records on them and the thrill of team accomplishment. With a sheet of gummed paper in his Blickensderfer typewriter (he was a "Blick" enthusiast), he went through the manuscript from beginning to end, selecting and typing entries as he went along. With this part, the real making of

Hybridizing wheat, probably about 1893.

an index, we of course had nothing to do. Then with the guillotine paper cutter, the entries were cut apart, and we had a heap of "paper spaghetti". Dinner plates, one for each letter of the alphabet, were placed in order around the dining table (always large, for our family, and always used between meals for various purposes) and, each of us supplied with a handful of slips, we rapidly dodged back and forth around the table distributing them, until the slips were all sorted alphabetically into the plates. Putting the rest by for the time, we took the "A" slips and repeated the sorting according to the second letter of the word. If the slips were many, they might be sorted the same way for the third letter. By this time it was easy to lay them in index order on sheets of foolscap paper. The final step was sticking the slips to the paper, and it was done very rapidly: with forceps, a slip was picked up by the right-hand end, drawn across a wet plate, and set in place on the sheet. Good! We had all pulled together and it was done--in time to free the table for dinner!

About these analyses of wheat, Phillippe de Vilmorin wrote to him from Paris: "I have been deeply interested in your articles on the Universal Nomenclature of Wheat, and especially in your new method of analysis. I hope you will soon come to Europe, as I would have many advices to ask from you." And A. D. Hall, Director of the Rothamsted Experiment Station, England, wrote: "Your method seems to give what we are looking for, a means of testing new cross-bred varieties so that we can form a sufficiently accurate judgment to enable us to discard 90% of them without having to grow them to any bulk."

In various parts of the world there was great interest in this work on wheat, which was giving a boost to the Australian industry, and N. A. Cobb was recognized at home and abroad as an authority. E. H. Gurney, Chemist to the Department of Agriculture, Queensland, wrote: "Your method will give the means of research on entirely new lines in connection with the production of flour." Dr. E. W. Hilgard, Professor of Agriculture in the University of California and Director of the U. S. Experiment Station wrote: "I have read with great interest your papers on the gluten and aleurone grains of cereals, (and note your almost German patience in this difficult investigation), which have given me some new ideas with regard to whole wheat flours, etc. I am strongly interested in whatever pertains to this subject."

Not quite half of the published work during his sixteen years as Plant Pathologist in the Department of Agriculture of New South Wales, reckoned either by number of titles or number of pages, dealt with plant diseases. Of the total of nearly two thousand pages (with the number of illustrations greater than the number of pages),

A part of the home laboratory of N. A. Cobb at "Kuring-gai", Pymble, N. S. W.

almost half dealt with bacterial and fungus diseases of cultivated plants; nearly one-fourth dealt with worm parasites of animals (tape worm, fluke and nematode) or with nematodes, either free-living or those parasitic in or on plants; and one-fourth dealt with wheat and the wheat industry - nomenclature, standardizing and improving the varieties, harvesting and handling the grain, grain elevators, diseases of wheat, and the structure of the wheat grain. In addition to papers in these main groups, there are about a dozen dealing with insteuments, laboratory techniques, and methods. Some of these papers were published by the Linnean Society of New South Wales, but the greater number are official publications of the Department of Agriculture, and may mostly be found in the *Agricultural Gazette of New South Wales* and as separate government reprints.

The *Agricultural Gazette* was a highly creditable monthly publication of the government. Though it contained an occasional trifling article, it was mainly of solid worth. It was an unusually well illustrated publication, most of the illustrations of which were prepared in the office of the Pathologist by himself and the team of artists which he had gathered together. At this time drawings, paintings and engravings were still used more than photography for both scientific and popular illustrating, and many of the numerous plates in the *Agricultural Gazette* were truly works of art. Beautifully colored lithographs were not uncommon; lively line drawings and the finest of woodcuts were plentiful. As a child, though quite unconcerned with the text, I loved to look at the *Agricultural Gazette* as a picture-book.

This publication was intended for practical use by farmers, and contained much non-technical explanation and advice. At the same time it published original research and many articles of purely scientific value, such as taxonomic studies and descriptions of new species. While he was in the Department, N. A. Cobb contributed

to it about twice as much material as any other one writer. His articles combined pure and applied science, — and common-sense advice. Application of science to practical problems appealed to his ingenuity, while the purely scientific was inescapable because of his lively innate curiosity. Perhaps advice to farmers could be given as well on an empirical basis, but that he could not do. He had to know how and why, and every disease and its host had to be thoroughly studied, and the science of the subject presented. Then, the matters of purely scientific value found along the way had to be studied and an excuse found for their publication. The published "practical" paper had to carry with it as heavy a load of pure science as it could bear.

An additional reason for father's proposed resignation in New South Wales in 1898 (which had resulted instead in a leave-of-absence of two and a half years) had been the educational needs of his children, for the oldest was then thirteen. When our parents had decided, in 1890, to stay on in Australia, they had agreed together to return "home" when the oldest child should become twelve years old, in order that all might have their higher education in American schools. So though we were back in Sydney again in 1901, we were not to remain for many years. When the reports resulting from his recent travels had been written, and the accumulated work taken care of, my father began to look for an opening in the United States — a slow proceeding from that distance, with letters taking about a month in each direction if they happened just to catch a steamer.

In 1903, United States Secretary of Agriculture, James Wilson asked my father to take charge of the organization of a Department of Agriculture in the Philippine Islands, a position important in determining American policies in tropical agriculture. This was of course a gratifying and alluring invitation, — but there was still the matter of his children's American education. I believe that it was hard for him to decline this offer.

In 1905, my father used his accumulated vacation of four months for making a trip to the United States, which resulted in the arrangement for his employment in the Department of Agriculture in Washington. I have told that Erwin F. Smith, on his own initiative, had gone to the Secretary of Agriculture to make a personal recommendation that my father be appointed, being led to this act by his appreciation of the ingenuity and research ability my father had shown in handling the bacterial disease of sugar cane called "gumming" (or "Cobb's disease") in an improvised make-shift plantation "laboratory" in Australia.

The appointment in Washington was to be preceded by a stay of about two years in Hawaii, in order to establish and direct the Division of Pathology and Physiology of the Hawaiian Sugar Planters Association Experiment Station in Honolulu. So we left Australia a few weeks after my father's return — weeks spent in arduous packing by all members of the family, each in accordance with his strength and ability. As transportation was by water, rates were low and furniture was taken in order to avoid having to replace it in Honolulu, where prices were much higher. The piano, a side-board of equal size, bureaus and other large pieces were crated. But the main job of packing was not the furniture, nor the many pictures framed under glass and the large oil paintings, nor the china, glassware and general household goods, nor books. It was the contents of the shop and laboratory — carpenter's tools, micro-scopes, microtome, chemical balance, cameras of various sizes, tripods, several typewriters, bottles of stains and chemicals, specimens in liquid, guns, cabinet letter files, and many other lesser instruments and items large and small. School was given up and we all "pitched in" and learned how to pack then if we never had before! As each crate, huge zinc-lined importing case, or box was nailed up it received a painted number and its content was recorded in "the book". (The number seventy-something comes to mind but that may be only approximate.) And were we proud when the goods arrived in Honolulu — One thin drinking glass alone was broken!

A problem of "plant industry" confronted us as we got ready to leave Australia. The house in which we lived, as well as some others scattered sparsely in this rural suburb, nine miles north of Sydney, had perhaps been built in one of the old abandoned orange orchards. Several large, old, untended trees stood at the back of our big yard and were now laden with ripe fruit. The fruit was scale-covered, slightly sour and seedy, but juicy and of good flavor. My father and I roughly estimated about a thousand to twelve hundred oranges on the best tree, and calculated that to empty the tree in the few weeks remaining before sailing we must use twenty-four a day! With a little help from the rest of the family we nearly did it.

HAWAII, 1905-07

Planning the new laboratory building and its equipment, and, organizing the Division of Pathology and Physiology, were the new directors first duties. The building was planned by my father, on shipboard during his return trip to Australia, I believe, and was built and ready for use when he arrived again in Honolulu. And before leaving Australia he secured for his new office two of the

of three artists who had worked with him for about fifteen years in New South Wales--E. M. Grosse, expert in pen drawing, black-and-white wash and water-color painting, and W. E. Chambers, wood engraver and pen artist. (At the end of the two years in Honolulu, the former returned to Sydney, the latter went on to Washington with my father, and became known as a distinguished scientific illustrator.)

In this laboratory my father was able for the first time to put into effect his idea of mounting his microscope on a firm foundation completely free from the building, to avoid vibrations; and from this time on the microscope for his finest work always escaped the jarring of the building by being attached to a steel pillar or rail, imbedded in cement in the earth below and free from contact with the building through which it passed. This microscope foundation was always at a window or in a bay window, for to him no other light was equal to sunshine on white clouds, or to sunlight reflected from a white cloth which could be turned at will to direct the light into the mirror of the microscope. For such a reflecting screen he used white cotton sheeting (removable for occasional washing) on a frame about three by four feet, mounted on a Hill clothes drier frame, which could be pulled in when desired. The reflecting surface was kept at the correct angle to the sun through use of attached cords by which it could be turned by the microscopist without moving far from his instrument, though the screen might be fifteen feet away. A two-inch piece of mirror on one corner of the screen was used as a finder to spot the microscope.

Diseases of sugar cane and their prevention were the subjects of study during the two years in Hawaii (1905-07). From the laboratory in Honolulu, trips were made to plantations on the various islands. The five bulletins of his Division which my father wrote contain over five hundred pages, with many figures and colored plates by the artists. His other botanical publications of this time were a short paper on some diseases of the pineapple and two articles for Bailey's *Cyclopedia of American Horticulture*, on Sugar Cane and on Agriculture in Hawaii.

Because he knew that his stay here would be short, and because his home was only a few minutes walk from the experiment station, my father did not establish his usual elaborate home laboratory; but he did make the bathroom into a convenient darkroom so we could make photographs of the strange and beautiful scenes and plants. The lovely specimen palms on the lawns of Honolulu charmed him and he decided to get a series of photographs of the various species. There is a time at dawn, just before sun-up, when the trade

winds which all day wave the palm leaves have not yet begun to stir. The light is already bright enough for short time-exposures, and the effect much better than in sunshine. We took advantage of this daily lull. My father chose the subjects ahead of time, and his four daughters got up before dawn and went out as two teams, with two 5 X 7 cameras. In this way we got some fine photographs; but they have never been used.

BUREAU OF PLANT INDUSTRY
WASHINGTON D. C., 1907-32

The half century of my father's adult professional life, from the age of twenty-two, when he received his bachelor's degree at Worcester Free Institute in 1881, to the time of his death, June 4, 1932, fell into two periods of about equal length. In the earlier quarter century his occupations were various and his work largely abroad. The second quarter century was spent with the Department of Agriculture in Washington.

The first few years in Washington were largely given to work on cotton, especially to the setting of the "U. S. Official Cotton Standard Grades" in accordance with which cotton is marketed, to devising a method for their storage in a vacuum and to problems of spinning and milling; but for the greater part of the quarter century his time was devoted entirely to the study of nematodes, though for several yesrs he was Acting Assistant Chief of the Bureau of Plant Industry. As head of the Division of Nematology of the Bureau of Plant Industry, which grew under his headship from a newly formed office to a flourishing division, his work was with the free-living nematodes found in soil and fresh water, and those parasitic on or in plants. At the same time, in his private laboratory at home, often with the help of one or another of his daughters (who for the time made it a major job) he worked on marine nematodes, a study highly valuable from the point of understanding nemas but not of enough immediate economic importance to be justifiable in his government office.

After joining the Bureau of Plant Industry as Agricultural Technologist, N. A. Cobb's botanical publishing was entirely on cotton, except for an address before the Bakers' Institute on "The Inner Structure of the Grain as Related to Flour and Bread". From 1912 to 1916 he published about 200 pages of writings on cotton, most of this in two papers elaborating his addresses of 1912 and 1916 to the National Association of Cotton Manufacturers, and published by the Association: "An Accurate Method of Measuring Cotton Staple"

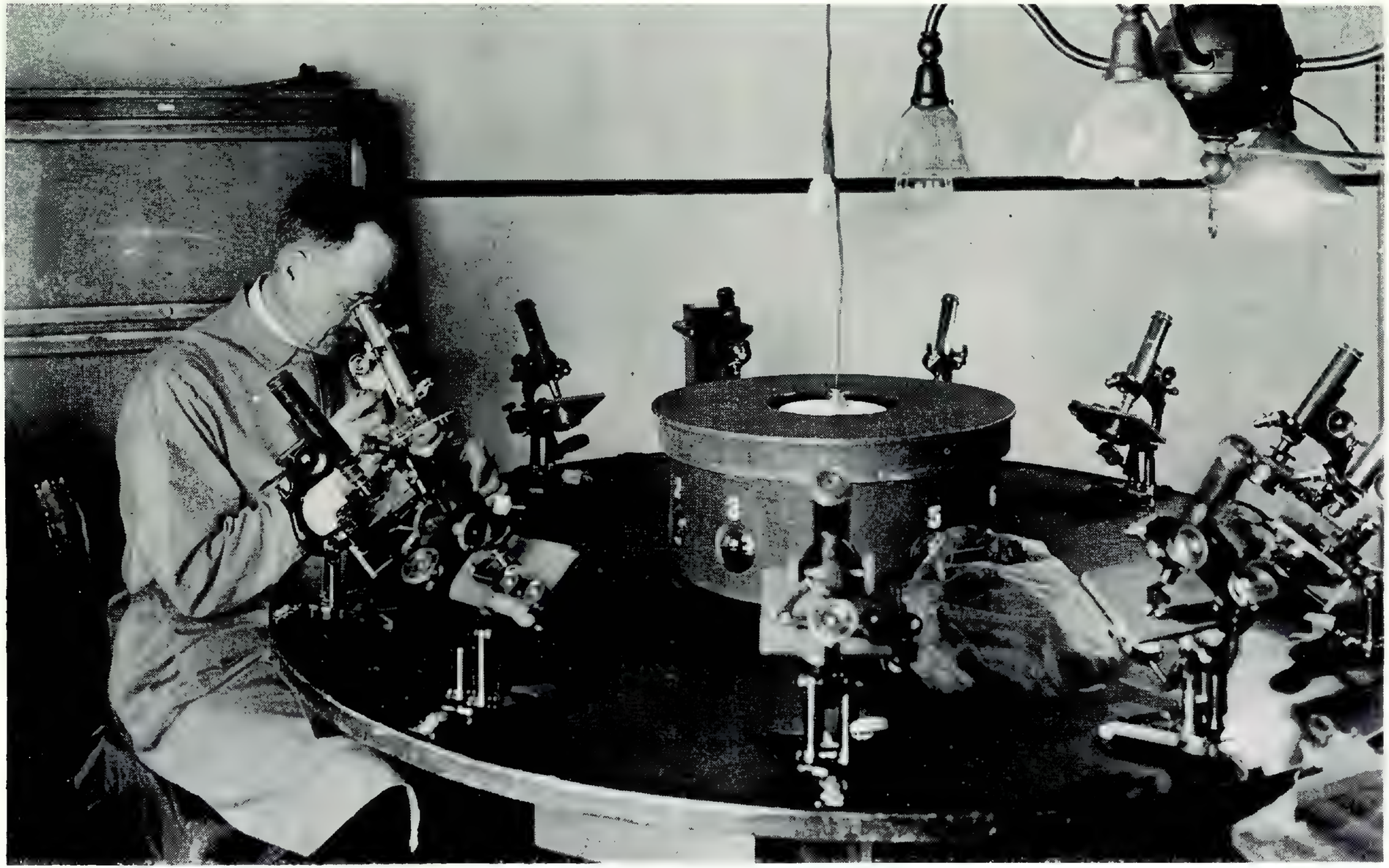
and "Methods of Determining Length of Cotton Staple and Illustrations of Their Application". In 1916 he was given the medal of the National Association of Cotton Manufacturers in appreciation of the value of his work. Two pamphlets published by the government (1914) summed up the results of his work in setting the U. S. Standard Official Cotton Grades.

During these earlier years in Washington he was continuing his nematode research and publication as usual; but he took great satisfaction also in this work with cotton— setting government standard grades of quality and especially with the problems of techniques in milling. This was a field in which he could exercise his Yankee ingenuity, as in his study of wheat in Australia, and his heart was in the work. But in 1915 a blow fell: without warning, or discussion with him, the work on cotton was suddenly taken from his office. Aside from the death of his son, Roger, in Australia, in 1901, this was his greatest shock within my own memory. He was so hurt by the action, and by the manner of it, that he offered his resignation, which of course was not accepted. From then on, for the rest of his life, his work for the government was entirely in the field of nematology, and before his death he was acknowledged to be the world's authority in his field. His last paper dealing with textiles was a short one in the Textile World Journal, 1920, "An Approach to Textile Fibre Research". His last work with sugar cane was in 1909 when he went twice to Jamaica to serve the sugar industry, once staying for most of a month.

WRITINGS

Though my father had little time for reading beyond scientific books and journals, the daily news, and at times a news weekly, he had a keen appreciation of literary style, and did sometimes take a little time for good literature, in part for recreation and in part for his own improvement. In the earlier years he must have read fairly widely; but later, in the limited time spared, he stuck rather closely to rereading a few favorite authors--Stevenson, Mark Twain, Joel Chandler Harris, Thoreau, John Burroughs and Louisa M. Alcott (!) He read aloud well, and was especially good in reproducing dialects. One of our most delightful childhood memories is of his reading the Brer Rabbit stories to us; of these we never tired, any more than did the Little Boy to whom they are originally told.

Though he had always shown great interest in the doings of his own four daughters, I was once quite puzzled at his apparent interest in the doings of the four young heroines of *Little Women.*



N. A. Cobb at work at one of his rotating microscope tables, Division of Nematology, Bureau of Plant Industry, U. S. Department of Agriculture.

A few years later I found him again reading *Little Women*, and this time was old enough and perplexed enough to ask him why. He was amused at my wonder, and rather surprised that I had to ask; to him it was so plain. Very earnestly he told me that it was for the improvement of his style in writing his scientific papers. Louisa Alcott gave him a model of simple, clear writing, and he aimed to follow her example. Open one of her books anywhere, he told me, read a page, and see if you find any ponderous Latin words. The little, vivid Anglo-Saxon words in simple construction give a much livelier and more telling style, he pointed out. Just as the drawings illustrating his papers have the sparkle resulting from their great reduction from unusually large originals, so he aimed to have his text composed with such care for simple words as to have a corresponding brilliance.

My father wrote no books, so called; but several of his "papers" ran over a hundred pages, the longest being a "bulletin" of 254 pages. His publications were mainly devoted to the results of his own researches. The space on my book shelves taken by the bound publications of his lifetime (unfortunately incomplete by more than fifty papers written during the Australian years, and by many short papers read before the Helminthological Society of Washington), measures over ten inches - about four and a half inches on nematology, four on plant pathology (including much on practical application to agriculture), and one and a half on wheat and cotton. He contributed to the science and literature of three major plant industries - wheat, sugar cane (in Australia, Hawaii, and Jamaica), and cotton.

INSTRUMENTS

One could hardly write about my father without writing of instruments and equipment. He loved equipment; loved to design and make it, to remake and improve it if bought, and to have it everywhere in abundance. He was an ingenious inventor, and held a number of patents for photographic devices and microscope accessories. Because of being in government service he was unable to utilize these patents and they lapsed without the devices ever having been put on the market. It was his plan, I believe, to do

Sieving for nematodes at Carlisle Bay, Jamaica, Dec. 19, 1909.

something with them after retiring, a time which never came. But his own laboratories bristled with these unique instruments and unusual arrangements. Among these his round tables of microscopes became famous.

In comparing specimens under the microscope, for identification, my father thought it impossible to hold an image in mind long enough to remove a slide from the stage, to replace it by one bearing the specimen to be compared, to focus, to find the object, and to shift to the immersion lens. He wanted each of the specimens under comparison to be already in adjustment on its own microscope. So finally he built revolving round tables, both in his government offices and in his own home laboratories, with nine or eleven microscopes placed around the edge, each with its mirror turned to the central light which had a face to serve each mirror. Without changing his position, he turned the table to bring to him one or another microscope with its specimen already in position and in focus. When there was a question of two specimens being of the same species, he would turn the table back and forth, back and forth, comparing one feature after another until he reached his conclusion -- just as one working with larger forms might hold a specimen in either hand, and look first at one and then the other.

As my father disliked glitter and cared little for the glamor of a handsome instrument, and as the use of this battery system left need for very little manipulation of the instruments beyond focusing after the object was under the immersion lens, very simple stands would serve. (In fact, at one time he used home-made wooden microscopes.) Even non-standard instruments with substandard stages could qualify, for with his own highly efficient but absurdly simple "mechanical stage" and "finder slide" he could dispense with an ordinary mechanical stage. For his home laboratory, he once bought, at a low price, a batch of ten microscopes which had been discarded by a university for a more up-to-date model. These he partially rebuilt, equipping them with surprisingly simple but extremely sensitive fine adjustments of his own make and design, and supplying them with objectives as condensers. (He thought that the lens below the object should be like that above, and for his finest work used a pair of oil immersion lenses.) On these "battery" stands, all that was needed was an ordinary low power objective, to find the object, and an oil immersion lens. Good immersion lenses, good light, a sensitive fine adjustment, and rigidity were his requirements. These multi-microscope set-ups were used for sorting and identifying specimens; but for critical work on anatomy and physiology, the single, more elaborate microscope with more accessories was used, with sunlight reflected from a white surface.

As scientific activities never ceased for my father with the ending of office hours, he had well-equipped laboratories and shops in his home. During his years as plant pathologist, there was much planned field work at experiment farms, field stations, and plantations, and these, too, were well stocked with apparatus as far as feasible. His trips were burdened with baggage. As a last degree of preparedness he carried on his person a rather elaborate assortment of instruments and tools, as permanent equipment.

His was a wonderful vest--the "White Knight vest" it should be called! At first my mother used to alter the vest pockets of a new suit to fit his instruments; but later he had his suits tailored and the vest pockets made to order. In the lower tier were two watch pockets, one on each side, and in them a good gold watch, and a silver one for use in the laboratory and dark room—and to check the gold one. For several years (until it ceased to work well) the second was a gunmetal alarm watch. Each watch fastened to the front buttonhole by a gold chain, and in the centre dangled a bunch of little charms, souvenirs of his travels. His children when small loved to sit on his knee and have him tell the story of each: a tiny New Zealand greenstone club; a red coral drop from a pair of earrings taken off and given him by an Algerian girl when he asked to buy them; an alligator's tooth from Florida; a tiny white sphere of Niagara spar; a bead from an Indian chief's moccasin; a tiny gold heart with red enamel front and a pearl in the centre, from London; western agate, green, in the form of a little buffalo horn; and a small oval, closed gold locket holding two pictures of my mother. Though his dress was otherwise exceedingly conservative and almost drab, he had a quiet pleasure in these bright little dangles.

Beside the watch pockets were a case of his professional and social calling cards and a wee black japanned tin box (2 1/8 by 1 3/4 by 1/2 inches) of Windsor and Newton water color paints with two good sable brushes, the wooden handle detached from the metal ferrule for packing. My father's notes abound with sketches, in pencil or water color, of all kinds of things that interested him: some large slugs that he found one morning at the base of the apricot tree at his first little Australian home; an idea for a photographic shutter that just came to his mind; an odd nema in a temporary mount in the field; a disease spot on a leaf, etc. More than anyone I have known he used pencil, pen and water color sketches in field and laboratory as a quick accurate method of making notes. Of course the little paint box that he carried in his vest pocket was mostly used for unpremeditated work; for planned drawing he had more elaborate outfits. And it is surprising how many little color notes can be made from even so small a box;

after many years of use, the pans are still half full!

The upper vest pockets on one side were divided into slots for two fountain pens (one with red ink), pencil, red-blue pencil, sable brush set in a metal thermometer case for protection, a pair of dull pointed curved forceps, 2 dissecting needles reversed in metal handles with chucks, a very narrow 6-inch steel rule, and a diamond glass cutter. On the other side were two shallow tin boxes ("Bengal Little Cigars") 3 1/2 by 3 1/4 inches, and less than 3/8 of an inch deep, curved to fit the body. One held paper of various kinds cut to fit it -- Whatman's "hot-pressed" for watercolor notes, plain and cross-ruled paper of various sorts. The other held a variety of small tools: a pocket spirit level; fine oil stone for sharpening his pocket knife and needles; a pair of folding compasses, with reversible pencil and point on one legand pen and point on the other, a try-square (in 3 pieces) with changeable straight and angled blades; and needles of several kinds.

His hand lens and pocket knife were always with him among the coins, buttons, etc. in his trouser pockets. The knife, of good English make (George Wostenholm, Sheffield) I think must have been bought soon after he reached Australia, and as long as he lived there the larger of the two blades was kept razor-sharp and reserved but never used for first aid in case of snake-bite.

FAMILY COOPERATION

Not only at the beginning but all through my father's scientific career my mother was his admiring and devoted helper. In an account of his accomplishment she must be included; whatever he did, botanically and otherwise, should be credited also to her. She "lived by the code that scientific work must go on whatever the inconvenience or sacrifice", Dr. J. R. Christy wrote. "Great should be her satisfaction in realizing that hers was no minor contribution towards securing for her husband an undisputed place among the eminent men of Science."[1]

Her help was direct, at times when that was possible, as for instance in Jena, where because of the three babies she was seldom able to leave their apartment. Here for his use she carefully traced figures and transcribed in her own good script many, many pages

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[1]Transactions of the American Microscopical Society, Vol. LI, No. 4, p. 278 Oct. 1932.

from German works, which she could not understand, as well as illustrations, from reference books which he could not have or did not need in full.

Always there were difficult jobs of "scientific" sewing being sweetly requested: dust covers for dozens of microscopes; little cases for special instruments; a large box kite for some photographic experiments; sets of black curtains for microscope windows of successive home laboratories, to relieve the eyes of all light except that coming through the microscope; rubber cloth covers for camera plate holders; a light-proof bag of black velvet lined with rubber cloth for changing the plates in a camera he was making; a cotton sheeting cover for a thirty-foot long aluminum model of a cotton fibre, to be used in a lecture.

There was usually material left over from these sewing jobs, as well as from other construction and experiments; and this happened so often that my mother used to remark, with a smile, that she had "brought up the family largely on the by-products of science". I remember family underwear made of the box-kite material for long afterwards. For years, the fancy crackers which we bought were sure to be the small Nabisco wafers; these were the exact size of microscope slides, and the neat tin boxes in which they came were needed for storing the aluminum microscope slides which he invented and used for mounting nematodes, slides permitting stacking of one on another without grooves for separation. We all grew up using Colgate's Cashmere Bouquet soap for brushing our teeth, from the first year in Australia when he undertook to sell this product, among others, for the American merchant. In order to be able to say "none purer", he sawed in two several cakes of all obtainable soaps, to secure centre samples for analyses, and was so convinced of the high quality of Cashmere Bouquet that, while the other discarded half-cakes were soon used up for various household purposes, this kind was saved for the children to use in brushing their teeth! The half-cakes lasted, I believe, several years into the time of my memory; and by then its use was habitual.

But my mother's direct help in my father's work was not so essential to his success as was her constant effort to keep for him a home environment in which he could peacefully do his best. There were, of course, occasional illnesses in the family; and at these times my father was troubled, for he was a loving father, unusually fond of babies and little children, and a most gentle nurse. But illness aside, there was in his home much to help and little to hinder his work; my mother kept the household running smoothly, backed his undertakings and plans, and fitted the housekeeping into them.

There seemed always to be perfect accord between them; had we ever heard them quarrel or speak unkindly to one another we would have thought the bottom of the world had dropped out.

Not only my mother's "devotion to the cause" was passed on to her children, but also her admiration of my father, confidence in his ability and pride in his accomplishments. To her he was truly the most wonderful man in the world; to us, too! Even now, in writing this account, it is plain that I cannot escape from that ingrained regard for him; cannot presume to try, even, to appraise him. We were all grown up, I believe, before we ever thought of the possibility that he might have any human frailty, could ever be at fault or make a mistake. (Well, twice I knew him to lose patience and temper with one of us, a pretty good record for a father of six normal children; but those two times made a terrible impression on me and I never could quite believe them really true.) We had profound respect for him and deep admiration as well as love. I believe that not one of his children ever spoke to him rudely or saucily, or of him disrespectfully. It was never even thought of. As is usual, our mother was taken for granted by us, and only when grown up did we become aware of the complete devotion of her life to her family, and her unbroken cheerfulness and good temper. But, by our mother's example, we were conscious from the first of our admiration for our father; and of his importance in the household we were always aware.

After the health of the family, his working needs came first. Always when we moved (and we lived in eight houses, in Australia, Hawaii, and Eastern United States, before I was through high school), the health of the family was the most important factor in choosing a locality and house. But once the house was selected, he naturally had the first choice of a room for his work; where the light was best and the conditions most suitable, his laboratory would be. There was a shop, too, and in our largest home my father had a separate study as well, and a projection gallery. We can all remember the importance of his laboratory and our awe of it --not that it was a place forbidden to us, far from it! We were encouraged to join in the scientific activities; in fact very frequently were drafted for wearisome scientific routine, not for only a few minutes, but perhaps for hours at a time, sometimes for weeks together. Not my mother alone, but the whole family gave creditable support to my father's research. If ever a scientist had a cooperative family, he did. For us it was all to the good in training, and later most of us chose scientific fields of work; but I fear that, in spite of our loyalty and docile help, we sometimes thought enviously of the homes of our young friends, which lacked the laboratories we had always taken for

granted.

While as little ones we were contributing our mites to our father's career and carrying out his wishes with devotion, we were unconscious of his concern for our education and for our feelings toward him; but grown up, we could appreciate this other side of that equation which brought about a delightfully perfect relation between him and his children. He provided a college education for all five of us, and when we wished to go on into graduate work, advanced to us the means if needed. That is, the parents together did all this, for he always insisted that it was my mother's saving, more than his earning, that made possible our education and traveling. And he was right. She was a good economist. Our needs were well supplied, physical and intellectual, but nothing was wasted in our household, and absolutely nothing was spent on display or frills; all that it was possible to save was put by for education and scientific needs.

We started off to college each fall with a check large enough for the initial expenses and several months of routine, and the cheerful invitation to ask for more when needed. But so imbued were we with the spirit of thrift and so proud of our ability to keep down our expenses and keep up the family economy that not one ever took advantage of parental generosity. All that our father asked in exchange for the checks was that we keep careful expense accounts — not that he ever questioned them or even looked at them, but he was doubtless thinking that carefully kept and summarized records of spending lead toward careful spending. And how keen was the competition between us! Not only did we question: "Did I get through on less than last semester?" but "Did I do better than you did?"

How deeply our parents treasured our affection for them is shown by a letter from my mother to her son for his thirty-sixth birthday, in 1921. Sentimental letters were a great rarity in the family, and this one was saved and remembered. She wrote, in part: "Naturally my thoughts go back about thirty-six years just now. I wonder how far I have realized my ideal as a mother. Some of my children appear to rise up and call me blessed — which is a mother's fullest measure of reward and happiness. I am sure of Daddy's success in his greatest aim in connection with his children — to keep their affection, even at the sacrifice of other things. He has many times told me he desired to have their love above everything else." Of this he never spoke to us; but we felt it.

Dr. Gilbert Grosvenor wrote, in 1932: "Your father always took more pleasure in the affection of his children than in his remarkable

scientific achievements. I wonder sometimes if his children know how much they contributed to his happiness."

SCIENTIFIC PIONEER

It used to seem to me that my father had been unusually fortunate in having opportunities open for him at the right time -- a good free technical school recently established in Worcester when he could not afford to go to college; on graduation, a position at an unusually progressive preparátory school having sciences already in its curriculum and willing to allow him to pioneer in methods of teaching them; when he had received his doctor's degree in Jena, an opening for him at the table of the British Association at the Naples Zoological Station; a Department of Agriculture starting in New South Wales soon after he arrived there, with need of a trained biologist; the Division of Pathology and Physiology being formed by the Hawaiian Sugar Planters' Association at the time when he wished to return to this country; and then an opening in Washington. All this seemed like good luck; but now I see that it was, rather, his own persistence in eager study in a wide field that prepared him to be ready when he was needed. He may have had no specific training for jobs for which he engaged himself; but he was always qualified for them — or for whatever biological opening chance might bring — for his curiosity, imagination, and endless delight in research had gained him early a sound foundation from which he could branch out in any needed direction. He had the vision and the spirit and the confidence of an intellectual pioneer.

My father's entrance into the study of fungus diseases of plants came about because he was able and available in New South Wales when governments began to feel responsible for undertaking such studies. Though he never knew it, he was the first appointed full-time plant pathologist in the over-seas governments of the British Empire. Dr. E. J. Butler, in his presidential address* before the British Mycological Society, 1929, on "The Development of Economic Mycology in the Empire Overseas" said:

"From the middle of the last century, there was a rapid growth in appreciation of the injury done to living plants by parasitic fungi. The calamity of the potato blight in the years following 1845 focussed attention on the terrible potentialities for harm of these organisms, and when from 1869 onwards the coffee plantations of Ceylon, on which the prosperity of that Colony mainly depended, were swept by disease, the lessons of the potato blight epidemic were still

*Transactions of the British Mycological Society, Vol. 14, Part I, 1929.

fresh in men's minds. Nevertheless, it was more than ten years before the appeals of the Ceylon planters for scientific assistance were met by the decision to send out a special investigator from home. Harry Marshall Ward, whose biological training was begun under Huxley at South Kensington and completed under Sachs at Wurzburg, was appointed Government Cryptogamist for Ceylon in 1880, and sent out on a temporary mission to study the coffee leaf disease caused by *Hemileia vastatrix*, which by that time had caused a loss of some £15,000,000. He remained only two years, but in that brief period carried out one of the most complete, as it was the first, of the detailed studies of a disease of a tropical plantation crop caused by a fungus.

"In 1887 Mr. (afterwards Sir) Arthur E. Shipley was sent out on a special mission by the Colonial Office to investigate a disease of onions in Bermuda, the cause of which in a short time he elucidated as the fungal parasite *Peronospora Schleideni*.

"Ten years later the Ceylon planters were again faced with a serious disease in one of the crops -cacao- that had replaced the now abandoned coffee. This time they took matters into their own hands and secured a scientific adviser for themselves. John Bennett Carruthers, the son of William Carruthers, the Keeper of Botany at the Natural History Museum, was appointed Cryptogamist to the Ceylon Planters' Association in 1897 and remained in Ceylon until 1899, a period during which he published a series of reports on cacao canker.

"By this time, however, it was abundantly evident that these short tours by specially sent out men did not meet the needs of the rapidly growing agricultural industries of the overseas Empire, and as each Dependency founded a Government agricultural department the appointment of officers for the study of fungous diseases of plants became more and more common.

"In this development Australia led the way. In 1890 Daniel McAlpine, who had arrived in Melbourne from Scotland six years previously to take up a lectureship in biology, was appointed Vegetable Pathologist to the Department of Agriculture, Victoria. This and the almost coincident appointment of Cobb to a similar post in New South Wales were, so far as I have been able to ascertain, the first whole-time appointments to permanent posts in applied mycology in the Government service of any Dominion or Colony.

"Nathan Cobb arrived in Australia, after studying in the United States, not long after McAlpine, and was appointed as Vegetable

Pathologist to the Department of Agriculture, New South Wales, at about the same time as the latter. Though in 1893 he published a *Host and Habitat Index of Australian Fungi*, his interests were more in the study of function than of structure and his aims were to discover what the parasites with which he worked did, rather than what they were. In his pamphlet on *Fungus Diseases of the Sugar-cane*, published in the same year, he gave the first description of the bacterial disease still often known as Cobb's disease of sugar-cane, which has since proved such a serious menace to this crop in Australia, Fiji, Porto Rico and elsewhere. He is also responsible for the name "Bitter Pit" applied to the disease that has attracted so much attention in all apple-growing countries, and in his "Letters on the Diseases of Plants", published in the *Agricultural Gazette of New South Wales* from 1897 to 1904, a large amount of information on the economic aspect of fungous diseases in Australia is contained. The campaign against rust in wheat, the lines of which were laid down in a series of annual interstate Conferences from 1891 to 1894 and which stands out as one of the most fruitful instances of the co-operation of scientific and practical men on record, had no more energetic supporter than Cbbb. During this period too, he commenced his studies of the nematode worms that attack plants, to which he became more and more attracted as time went on. In 1905 he was appointed Director of the Division of Pathology and Physiology at the Experiment Station of the Hawaiian Sugar Planters' Association and he remained in Honolulu until called to the Bureau of Plant Industry in Washington. In recent years he has abandoned mycology for helminthology, but he ranks with McAlpine as one of the founders of plant pathology in the overseas parts of the Empire."

In recalling her school days, my mother told us how in the fine spring weather the little girls used to run out at recess to their corner of the playground to "play house". First, each would choose her house site; then, with a small branch, carefully sweep the hard earth, brushing away the litter which had come since yesterday. Next they gathered up the small stones, scattered since their last play, with which they marked out the rooms of their new houses. Intent on her own plan, each arranged and re-arranged her house until finally she was satisfied and would turn to begin the play, to call on her neighbors, when -- -- the bell would ring!

My father, listening to this tale of the school-girls' play, looked sadly thoughtful. His home in Falls Church, Virginia, the first house he had ever owned, had through twenty-four years been carefully prepared for continuation of eager research, so that retirement, when forced upon him, would not mean laying down his work. He heard my mother's story, and said wistfully: "Yes, that is the way it is; always the bell will ring!".

When in June of 1929 my father reached seventy years, and was at the height of his career, with no sign of mental or physical aging, he was given by the government a three-year extension of service, an unusual recognition. This period was not quite completed; his work, still undiminishing, was abruptly ended by The Bell.

To my mother, in 1933, Dr. Butler wrote:

IMPERIAL MYCOLOGICAL INSTITUTE
Ferry Lane, Kew, Surrey.
England.

25th May, 1933

My dear Mrs. Cobb,

It was most kind of you to send me the reprint containing a photograph of Dr. Cobb. We are having it enlarged and placing it in this Institute in a prominent position. You will see from the brief historical survey of which I am sending you a copy that Dr. Cobb will always rank with Daniel McAlpine as one of the two founders of the science of plant pathology in the overseas parts of the British Empire. These were the first two men to be appointed by any of our overseas Governments to whole-time permanent appointments as plant pathologists. Dr. Cobb's appointment antedated that of McAlpine by a few weeks, a fact which I had not been able to ascertain when I wrote this paper. He was appointed in April, McAlpine in May, 1890 and both died within a few months of one another in 1932. McAlpine I never met, but I had the pleasure of spending an hour with your husband on my first visit to the United States in 1921. It is fitting that both their portraits should adorn our walls in company with that of Berkeley, the father of British mycology. All three were outstanding men and true pioneers in science.

Will you in conclusion permit me to express my deep sympathy with you in your loss.

Yours sincerely,

E. J. Butler

A LIST OF THE PUBLICATIONS OF N. A. COBB, COMPLETE FOR THE PERIOD OF HIS BOTANICAL ACTIVITY, 1885 THROUGH 1916.

Subsequent contributions, (1917-1932), with few exceptions, deal with nematodes and have botanical interest only to the plant pathologist and general ecologist, since most of them concern species that live in the roots of plants. Of these, only nine of relatively general bearing are recorded here.

In the listing of the earlier Australian articles, reprints are noted because they were often repaged and altered, and of later date. Unchanged author's separates of more recent years are not noted. Numerous newspaper articles are omitted.

1885

1. Elements of Chemistry. Part first . . . Easthampton, Mass. [1885] 2 + 101 pp., illust.

1887

2. Botany of Hampshire County — Introductory Remarks — Catalog of plants growing wild within thirty miles of Amherst. In: Gazetteer of Hampshire County, Mass., Part First 1654-1887. Compiled and edited by W. B. Gay. 1887. Published by W. B. Gay & Co., Syracuse. N. Y. (pp. 22-72).

3. A list of Plants found growing wild within Thirty Miles of Amherst. S. E. Bridgman & Co., Northampton, Mass., 1887. 51 pp.: second ed. of preceding.

1888

4. Beiträge zur Anatomie und Ontogenie der Nematoden. Sonder-Abdruck aus der Jenaischen Zeitschrift für Naturwissenschaft, XXIII Bd., N. F. XVI, pp. 41-76, pl. III-V. 1888.

Reprinted. "Inaugural-Dissertation z. Erlangen der Doktorwürde". Jena: Gustav Fischer. 1888.

1889

5. The differentiator. Modified from report read before the British Association, September 11, 1889, at Newcastle, England. Amer. Nat. 23: 745-747. 1889.

6. Neue parasitische Nematoden. Sonder-Abdruck. 3 pp. Berlin, 1889. (Archiv für Naturgeschichte, 55, vol. II, Heft 3: 49.)

1890

7. A nematode formula. Agric. Gaz. New South Wales, 1: 131-135.
Reprinted. New South Wales, Dept. Agric., Pamph. 1. Sydney: Gov't. Printer. 1890. 5 pp.

8. Tylenchus and root-gall. Agric. Gaz. New South Wales, 1: 155-184, 1 pl., 8 figs. 1890.

9. Contributions to an economic knowledge of the Australian rusts (Uredineae). I-II [and Appendix A]. Agric. Gaz. New South Wales, 1: 185-214, 18 figs. 1890.

10. Two new instruments for biologists. Proc. Linn. Soc. New South Wales, s. 2, 5: 157-167, pl. 7. 1890.

11. Oxyuris larvae hatched in the human stomach under normal conditions. Proc. Linn. Soc. New South Wales, s. 2, 5: 168-185, pl. 8, 1900.

12. Arabian nematodes. Proc. Linn. Soc. New South Wales, s. 2, 5: 449-468, [viii]. 1890.

13. Report on the Occupation of the Table at the Zoological Station at Naples. Brit. Assoc. Adv. Sci., Rep. 59th Meeting, 1889, 97-100. 1890.

1891

14. Notes on diseases of plants. Agric. Gaz. New South Wales, 2: 60-62, 155-157, 285-287, 347-348, 492-494, 616-624. 1891.
Reprinted in part (pp. 616-624) and repaged. Sydney: Gov't Printer. 1891. 9 pp., pl., 5 figs.

15. (A. Sidney Olliff, joint author.) Insect-larva (Cecidomyia sp.) eating rust on wheat and flax. Agric. Gaz. New South Wales, 2: 67-70.
Reprinted. Annals & Mag. Nat. Hist., ser. 6, vol. 7: 489-493. June 1891.

16. Pathological notes. Agric. Gaz. New South Wales, 2: 107-108, 4 figs.; 215-216. 1891.

17. Hair-worm (Gordius sp.). Agric. Gaz. New South Wales, 2: 213-214. 1891.

18. Strawberry-bunch. (A new disease caused by nematodes.) Agric. Gaz. New South Wales, 2: 390-400, 1 pl., 1 fig. 1891.
Reprinted.

19. Maize for the table. Agric. Gaz. New South Wales, 2: 524-534. 1891.

20. Parasites in the stomach of a cow. Agric. Gaz. New South Wales, 2: 614-615, fig. 1891.

21. Smuts. Agric. Gaz. New South Wales, 2: 672-677. 1891.
Reprinted, repaged and enlarged. Sydney: Gov't Printer. 1892. 7 pp., 7 figs.

22. The devastating eel-worm (*Tylenchus devastatrix*, Kuhn). Agric. Gaz. New South Wales, 2: 678-682. 1891.

Reprinted and repaged. New South Wales, Dept. Agric., Misc. Publ. 9. Sydney: Gov't Printer. 1891. 8 pp., 3 figs.

23. Dialogue concerning the manner in which a poisonous spray does its work in preventing or checking blight. Agric. Gaz. New South Wales, 2: 779-786, 6 figs. 1891.

Reprinted, repaged. Sydney: Gov't Printer. 1892. 8 pp., 6 figs.

24. Anticoma: a genus of free-living marine nematodes. Proc. Linn. Soc. New South Wales, s. 2, 5: 765-774. 1891.

25. Onyx and Dipeltis; new nematode genera, with a note on Dorylaimus. Proc. Linn. Soc. New South Wales, s. 2, 6: 143-158. 1891.

26. Report on rust in wheat experiments, New South Wales. Rpt. Proc. Rust in Wheat Conf., 2 (1891) : 31-36. 1891.

1892

27. Contributions to an economic knowledge of the Australian rusts (Uredineae). [III-IV and Appendix B.] Agric. Gaz. New South Wales, 3: 44-68. figs. 19-32. 1892.

28. Contributions to an economic knowledge of Australian rusts (Uredineae). [V, Appendices C-F.] Agric. Gaz. New South Wales, 3: 181-212, figs. 32-44. 1892.

Reprinted, repaged. Dept. Agric. New South Wales. Sydney: 1892. 32 pp., 13 figs.

29. Plant diseases and how to prevent them. Agric. Gaz. New South Wales, 3: 276-303, 436-439, 991-1006, 1 plate, 22 figs.

Reprinted in part (pp. 276-303). Dept. Agric. New South Wales, Misc. Publ. 12. Sydney: Gov't Printer. 1892. 30 pp., 4 pl., 26 figs.

30. Cold storage for apples from the vegetable pathologist's point of view. Agric. Gaz. New South Wales, 3: 581-585. 1892.

Reprinted, repaged. Sydney: Gov't Printer. 1892. 5 pp.

31. Cooke's Handbook of Australian fungi. Agric. Gaz. New South Wales, 3: 696-697. 1892.

32. Notes on the diseases of plants. Agric. Gaz. New South Wales, 3: 833-834. 1892.

33. Report on experiments. Rpt. Proc. Rust in Wheat Conf., 3 (1892) : 27-34. 1892.

1893

34. Nematodes, mostly Australian and Fijian. In: Macleay Memorial Volume.

Sydney, London and Berlin: Linnean Society of New South Wales. 1893. (p. 252-308, pl. XXXVI-XLII)

Reprinted. Dept. Agric., New South Wales. Misc. Publ. 13. Sydney: F. Cunninghame & Co. 1893. 59 pp., 6 pl.

35. Contributions to an economic knowledge of Australian rusts (Uredineae). [VI, VII-IX.] Agric. Gaz. New South Wales, 4: 431-470, 503-515, figs. 45-97. 1893.

36. Plant diseases and their remedies. Diseases of the Sugar-cane. Agric. Gaz. New South Wales, 4: 777-833, 46 figs. 1893.

Reprinted and repaged. Sydney: Chas. Potter Government Printer. 1893. 56 pp.

37. Host and habitat index of the Australian Fungi. Dept. Agric., New South Wales, Misc. Publ. 16. Sydney: Gov't Printer. 1893. 2 + 44 pp.

38. The gumming of sugar-cane. Preliminary report. Dept. Agric., New South Wales, Ann. Rpt., 1893: 8-10. 1893.

Extract. Royal Gardens, Kew, Bulletin, 1894: 1-4. Also in: Revue Agricole et Journal de la Chambre d' Agriculture, Maurice. 1894.

39. Tricoma and other new nematode genera. (With fifty illustrations in the text). Proc. Linn. Soc. New South Wales, s. 2, 8: 389-421, 14 figs. 1893.

1894

40. Contributions to an economic knowledge of the Australian rusts (Uredineae). X. Agric. Gaz. New South Wales, 5: 239-252. 1894.

Same, with title "Improving Wheats by Selection": Dept. Agric. New South Wales, Misc. Publ. 18. Sydney: Gov't Printer, 1894. 1+14+2 pp., illust.

41. Notes on the diseases of plants. Agric. Gaz. New South Wales, 5: 379-389. 1894.

Reprinted and repaged. Sydney: Gov't Printer, 1894. 11 pp., 14 figs., 1 pl.

42. A new Australian fungus. Agric. Gaz. New South Wales, 5: 390. 1894.
Reprinted, unpaged. Sydney: Gov't Printer. 1894. [*Peziza Lyonsiae.*]

43. Wheat Rust. Rpt. Proc. Rust in Wheat Conf., 4: 37-43. 1894.

44. Improving wheats by selection. Agric. Gaz. New South Wales 5: 239-257, 5 figs. 1894.

Reprinted, repaged. Dept. of Agric., New South Wales, Misc. Publ. 20. Sydney: Gov't Printer. 1894. 18 pp., 5 figs.

1895

45. The cause of gumming in sugar-cane. Agric. Gaz. New South Wales, 6: 683-689. 1895.

Reprinted, repaged. Sydney: Gov't Printer. 1895. 7 pp., 2 figs.

46. Notes on the form and size of the grain in different varieties of wheat. Agric. Gaz. New South Wales, 6: 744-751. 1895.
Reprinted, repaged. Dept. Agric. New South Wales, Misc. Publ. 260. Sydney: Gov't Printer. 1895. 8 pp.

47. Diseases of plants and their remedies. Agric. Gaz. New South Wales, 6: 858-867, figs. 1-13. 1895.
Reprinted, repaged. Sydney: Gov't Printer. 1896. 10 pp., 13 figs.

1896

48. The hot-air treatment of bunt or stinking smut. Agric. Gaz. New South Wales, 7: 82-83. 1896.

49. Notes on the threshing of wheat. Agric. Gaz. New South Wales, 7: 204-208. 1896.
Reprinted.

50. The hardness of the grain in the principal varieties of wheat. Agric. Gaz. New South Wales, 7: 279-298, 28 figs. 1896.
Reprinted, repaged. Sydney. Gov't Printer. 1896. 23 pp., 28 figs.

51. The relative hardness of Australian and American Fife wheats. Agric. Gaz. New South Wales, 7: 430-437, figs. 1-28. 1896.
Reprinted and repaged. Sydney: Gov't Printer. 1896. 8 pp., 21 figs. 1 pl.

52. Notes on the colour of the grain in different varieties of wheat. Agric. Gaz. New South Wales, 7: 517-520. 1896.
Reprinted and repaged. Sydney: Gov't Printer. 1896. 4 pp.

53. The common crow. Agric. Gaz. New South Wales, 7: 565-578. 1896.
Reprinted. Dept. Agric. New South Wales, Misc. Publ. 103. Sydney: Gov't Printer. 1896. 14 pp. 1 fig.

54. Agricultural experiment work. Agric. Gaz. New South Wales, 7: 663-689. 1896.
Reprinted. Dept. Agric. New South Wales, Misc. Publ. 116. Sydney: Gov't Printer. 1896. 29 pp., 49 figs.

55. Wormy fowls. Agric. Gaz. New South Wales, 7: 746-753, 8 figs. 1896.
Reprinted, repaged. Dept. Agric. New South Wales, Misc. Publ. 123. Sydney: Gov't Printer. 1896. 8 pp., 8 figs.

1897

56. The cause of an important apple disease. Agric. Gaz. New South Wales, 8: 126-127. 1897.
Reprinted, repaged. Dept. Agric. New South Wales, Misc. Publ. 140. Sydney: Gov't Printer. 1897. 2 pp., 1 pl., 1 fig.

57. Some useful observations on germinating wheat. Agric. Gaz. New South Wales, 8: 128-129, 1 pl. 1897.

Reprinted, repaged. Dept. Agric. New South Wales, Misc. Publ. 141. Sydney: Gov't Printer. 1897. 2 pp., 1 pl.

58. A method of using the microscope. Agric. Gaz. New South Wales, 8: 130-134. 1897.

Reprinted. Dept. Agric., New South Wales, Misc. Publ. 142. Sydney: Gov't Printer. 1897. 5 pp., 3 figs.

Reprinted. Journ. Roy. Micros. Soc., 1897: 433-438.

59. Letters on the diseases of plants. Agric. Gaz. New South Wales, 8: 208-252. 1897.

Reprinted, repaged. Dept. Agric. New South Wales, Misc. Publ. 149. Sydney: Gov't Printer. 1897. 54 pp., 60 figs.

60. The abandoned orchards of Cumberland County. Agric. Gaz. New South Wales, 8: 281-288, 4 pl., 9 figs. 1897.

Reprinted, repaged. Sydney: Gov't Printer. 1897. 10 pp., 4 pl., 9 figs.

61. The sheep-fluke. Agric. Gaz. New South Wales, 8: 453-481. 1897.

Reprinted. Dept. Agric. New South Wales, Misc. Publ. 167. Sydney: Gov't Printer. 1897. 32 pp., figs., 1 pl.

62. The "brush" of wheat grains. Agric. Gaz. New South Wales, 8: 524-527, figs. 1-20. 1897.

Reprinted, repaged. Dept. Agric. New South Wales, Misc. Publ. 172. Sydney: Gov't Printer. 4 pp., 20 figs.

63. The grading of wheats. Agric. Gaz. New South Wales, 8: 855-859, 6 pl. 1897.

Reprinted, repaged. Dept. Agric. New South Wales, Sydney: Gov't Printer. 1898. 7 pp., 6 pl.

1898

64. Notes on pests and crops. Agric. Gaz. New South Wales, 9: 182-186,. figs. 1-2. 1898.

Reprinted, repaged. Sydney: Gov't Printer. 1898. 7 pp., 2 figs.

65. Some tools useful in crop experiment work. Agric. Gaz. New South Wales, 9: 187-189, 1898.

Reprinted. Dept. Agric. New South Wales, Misc. Publ. 210. Sydney: Gov't Printer. 1898. 3 pp., 7 figs.

66. Extract from MS. report on the parasites of stock. Agric. Gaz. New South Wales, 9: 296-321, 419-454. 1898.

Reprinted, repaged. Dept. Agric. New South Wales, Misc. Publ. 215. Sydney: Gov't Printer. 1898. 62 pp., 129 figs.

67. Allora spring wheat. Agric. Gaz. New South Wales, 9: 608-609, col. pl. 1898.

68. The weight per bushel of Australian wheats. Agric. Gaz. New South Wales, 9: 876-881, illust. 1898.
Reprinted, repaged. Dept. Agric. New South Wales, Misc. Publ. 249. Sydney: Gov't Printer. 6 pp., illust.

69. Rattling Jack Wheat. Agric. Gaz. New South Wales, 9: 1395-1396, 1 col. pl. 1898.
Reprinted, repaged. Sydney: Gov't Printer. 1898.

70. Australian free-living marine nematodes. Proc. Linn. Soc. New South Wales, 23: 383-407. 1898.
Reprinted. Sydney: F. Cunningham & Co. 1898.

1899

71. Testing the speed of a photographic lens shutter. Jour. Worcester (Mass.) Polytech. Inst., 2: 202-208. 1899.

1900

72. Grain elevators. Agric. Gaz. New South Wales, 11: 187-194, 1900.
Reprinted, repaged. Dept. Agric., New South Wales. Sydney: Gov't Printer. 1900. 28 illust., 3 plates.

1901

73. Grain elevators. Agric. Gaz. New South Wales, 12: 255-301, 1 pl., 29 figs. 1901.
Reprinted, repaged. Dept. Agric., New South Wales, Misc. Publ. 452. Sydney: Gov't Printer. 1901. 47 pp., 29 figs., pl.
Reprinted. Queensland Agric. Journ., Brisbane, 1902.
Reprinted. Agric. Gaz. New South Wales, 17: 219-235, 327-339. 1906.

74. Woodiness of the passion fruit. Agric. Gaz. New South Wales, 12: 407-418. 1901.
Reprinted, repaged. Dept. Agric. New South Wales, Misc. Publ. 459. Sydney: Gov't Printer. 12 pp., 1 pl., 16 figs.

75. Root-gall. Agric. Gaz. New South Wales, 12: 1041-1052. 1901.
Reprinted, repaged. Dept. Agric. New South Wales, Misc. Publ. 495. Sydney: Gov't Printer. 1901. 12 pp., 8 figs.

76. A new eel-worm infesting the roots of the passion vine. Agric. Gaz. New South Wales, 12: 1115-1117. 1901.
Reprinted. Dept. Agric. New South Wales, Misc. Publ. 503. Sydney: Gov't Printer. 3 pp., 1 fig. 1901.

77. Foliage areas of different varieties of wheat. Agric. Gaz. New South Wales, 12: 1117. 1901.

Reprinted. Dept. Agric. New South Wales, Misc. Publ. 504. Sydney: Gov't Printer. 1901. 1 p.

78. The Californian wheat industry. Agric. Gaz. New South Wales, 12: 1317-1348, illust. 1901.

Reprinted, repaged. Dept. Agric. New South Wales, Misc. Publ. 519. Sydney: Gov't Printer. 1901. 32 pp., illust.

79. Universal nomenclature of wheat. Agric. Gaz. New South Wales, 12: 1614-1629, col. pl. 1901. 13: 74-90, figs. 1-9, pls. 1-4; 241-243, fig. 10, 1 pl; 415-418; 850, pls. 5-7. 1902. 14: 546-549, pls. 8-[10]. 1903. 15: 159-174, figs. 11-68; 358-363, figs. 69-73; 509-513, fig. 74, pls. 13-15. 1904.

Reprinted, repaged, in 1905, q. v.

1902

80. Tomato blights. Agric. Gaz. New South Wales, 13: 410-414. 1902.

Reprinted, repaged. Dept. Agric. New South Wales, Misc. Publ. 569. Sydney: Gov't Printer. 5 pp., 3 figs.

81. Comparative observations on the brush of about fifty varieties of wheat. Agric. Gaz. New South Wales, 13: 647-649. 1902.

Reprinted, repaged. Dept. Agric. New South Wales, Misc. Publ. 578. Sydney: Gov't Printer. 1902. 3 pp., 3 figs.

82. Probably occurrence of the tapeworm (Taenia ovilla) in Australian sheep. Agric. Gaz. New South Wales, 13: 796. 1902.

83. The nematode formula. Agric. Gaz. New South Wales, 13: 1023-1030. 1902.

Reprinted, repaged. Dept. Agric. New South Wales, Misc. Publ. 601. Sydney: Gov't Printer. 1902. 8 pp., 5 figs.

84. Internal structure of the gall-worm. Agric. Gaz. New South Wales, 13: 1031-1033. 1902.

Reprinted.

85. Rattling Tom wheat. Agric. Gaz. New South Wales, 13: 1229, 1 col. pl. 1902.

Reprinted, repaged. Sydney: Gov't Printer. 1902.

1903

86. Effect of engine boiler steam on the vitality of seeds and spores. Agric. Gaz. New South Wales, 14: 26-29. 1903.

Reprinted, repaged. Dept. Agric. New South Wales. Misc. Publ. 623. Sydney: Gov't Printer. 1903.

87. Seed wheat: an investigation and discussion of the relative value as seed of large plump and small shrivelled grains. Agric. Gaz. New South Wales, 14: 33-50, 145-169, 193-205. 1903.
Reprinted, repaged. Dept. Agric. New South Wales, Misc. Publ. 625. Sydney: W. A. Gullick, Gov't Printer. 1903. 60 pp. 36 figs.

88. A handy horse power. Agric. Gaz. New South Wales, 14: 170. 1903.
Reprinted. Sydney: Gov't Printer. 1903.

89. A disease of larkspur. Agric. Gaz. New South Wales, 14: 341. 1903.

90. Letters on the diseases of plants. Second series. Agric. Gaz. New South Wales, 14: 627-651, 681-712, 955-986, 1057-1072. 1903. 15: 1-19. 1904.
Reprinted. Department of Agriculture, New South Wales, Misc. Publ. 666. Sydney: Gov't Printer. 1904. T.p+133 pp., 7 col. pl., 132 figs.

1904

91. The sheep fluke. Agric. Gaz. New South Wales, 15: 658-669. 1904. (Continuation of item 61, 1897.)

92. Quantitative estimation of disease spores. Agric. Gaz. New South Wales, 15: 670-680. 1904.
Reprinted. Dept. Agric. New South Wales, Misc. Publ. 768. Sydney: Gov't Printer. 1904. 11 pp., 7 figs.

93. Parasites as an aid in determining organic relationships. Agric. Gaz. New South Wales, 15: 845-848. 1904.
Reprinted. Dept. Agric. New South Wales, Misc. Publ. 788. Sydney: Gov't Printer. 1904. 4 pp.

94. A grain of wheat; its structure and properties. Journ. Dept. Agric. West Aust., 9: 165-170. 1904.

95. Free-living fresh-water New Zealand nematodes. Proc. Cambridge Phil. Soc., 12, Pt. V: 363-374, 4 figs. 1904.

1905

96. The tapeworms of Australia. Agric. Gaz. New South Wales, 16: 153-168, 209-219, 311-318, 619-631. 1905.

97. The parasitic worm Heterakis inflexa, included in a fowl's egg. Agric. Gaz. New South Wales, 16: 561-562. 1905.

98. Quantitative estimation of bunt in seed-wheat. Agric. Gaz. New South Wales, 16: 1113-1117. 1905.

99. Annual Report Division of Pathology and Physiology. Rept. Exp. Sta. Comm., Hawaiian Sugar Planters' Assoc., 1904-05: 39-59. 1905.

100. Methods of using the microscope, camera-lucida and solar-projector for purposes of examination and the production of illustrations. Being the first annual report of the Division of Pathology and Physiology, Experiment Station of the Hawaiian Sugar Planters' Association. Honolulu, 1905. 1+29 pp., illust.

101. The inspection and disinfection of cane cuttings. Exp. Sta., Hawaiian Sugar Planters' Assoc., Div. Path. & Physiol., Bull. 1: 1-35, i-vi, 8 pl. Honolulu, 1905. Second edition, with eight original plates.

102. Third report on gumming of the sugar-cane. Exp. Sta., Hawaiian Sugar Planters' Assoc., Div. Path. & Physiol., Bull. 3: 1-46, figs. 1-12. Honolulu, 1905.
Reprinted. Hawaiian Planters' Monthly, 25: 13-36.

103. Universal nomenclature of wheat. Dept. Agric. New South Wales, Misc. Publ. 539. Sydney: W. A. Gullick, Government Printer. 1905. 1+75 pp., XV+1 pl (partly col.).
(Reprinted from Agric. Gaz. New South Wales, vols. 12-15. 1901-1904.)

1906

104. Some elements of plant pathology. Exp. Sta., Hawaiian Sugar Planters' Assoc., Div. Path. & Physiol., Bull. 4. Honolulu, 1906. 46+4 pp., 32 figs.

105. Fungus maladies of the sugar cane. Exp. Sta., Hawaiian Sugar Planters' Assoc., Div. Path. & Physiol., Bull. 5. Honolulu, 1906. 254 pp., frontisp., 7 pl., 102 figs.

106. Construction and fittings of a microscope room. Journ. Roy. Microsc. Soc. 446-508. 1906.
(Extracts from Rept. Exp. Sta. Comm., Hawaiian Sugar Planters' Assoc., 1904-05: 39-59.)

107. Annual report Division of Pathology and Physiology. Rept. Exp. Sta. Comm., Hawaiian Sugar Planters' Assoc., 1905-06: 51-55. 1906.

1907

108. Agriculture in Hawaii. In Bailey, L. H., Cyclop. Amer. Agric., 1: 114-121, pl. VI, figs. 128-136. 1907.

109. Sugar-cane. In Bailey, L. H., Cyclop. Amer. Agric., 2: 599-611, pl. XXIII, figs. 826-836. 1907.

110. Universal nomenclature of wheat. Amer. Miller, 35: 700-701, 792-793, 890-891, 957. 1907.
(Abridged from Agric. Gaz. New South Wales, 12-15. 1901-1904.)

111. Some Hawaiian crop blights. Hawaiian Forester & Agric., 4: 60-64. 1907.

112. Notes on some diseases of the pineapple. Hawaiian Forester & Agric., 4: 123-144. 1907.

Reprinted, repaged. Honolulu: Privately published. 1908.

113. Report on the germination of the seeds of rubber producing plants. Hawaiian Forester & Agric., 4: 233-235. 1907.

114. The sugar-cane disease known as Top-Rot. Exp. Sta. Hawaiian Sugar Planters Assoc., Div. Path. & Physiol., Circular No. 5. Honolulu, 1907. 6 pp.

1909

115. The inner structure of the grain as related to flour and bread. Bienn. Report Bur. Labor & Indust., State of Wisconsin, 13 (1907-08) :735-749, 5 figs. 1909.

(An enlargement in water-color of a flour-cell of wheat from this publication, done by the compiler of this bibliography, is used in teaching by the Department of Botany of the University of Michigan. This, and other highly detailed illustrations of grain histology from Dr. Cobb's publications should sometime have wider distribution as text-book illustrations.)

116. Fungus maladies of the sugar cane. Exp. Sta., Hawaiian Sugar Planters' Assoc., Div. Path. & Physiol. Bull. 6, 3+ [5-100]pp., illust., 7 col. pl. Honolulu: Hawaiian Star Print. 1909.

1910

117. The house fly. Nat. Geogr. Mag., 21, No. 5: 371-380, 4 figs. 1910.

118. Notes on the distances flies can travel. Nat. Geogr. Mag., 21, No. 5: 380-383. 1910.

1912

119. An accurate method of measuring cotton stapel. A paper read before the National Association of Cotton Manufacturers at its ninety-first meeting, Manchester, Vermont, Sept. 28, 1911. Boston, 1912. 26 pp., 19 figs.

120. Further notes on Tricoma. Journ. Wash. Acad. Sci., 2: 480-484, 2 figs. 1912.

121. Memorandum of information concerning official cotton grades. U. S. Dept. Agric., Bur. Plant Industry, Document 720. 1912.

1913

122. Draconema: A remarkable genus of marine free-living nematodes. Journ. Wash. Acad. Sci., 3: 145-149, 1 fig. 1913.
In author's separates the figure was hand-colored.

123. Notes on Mononchus and Tylenchulus. Journ. Wash. Acad. Sci., 3: 287-288, 2 figs. 1913.

124. New nematode genera found inhabiting fresh water and non-brackish soils. Journ. Wash. Acad. Sci., 3: 432-444, pl. 1913.

125. United States Official Cotton Grades. U. S. Dept. Agric., Bur. Plant Industry, Circ. 109. 1913. 6 pp.

1914

126. Antarctic Marine Free-Living Nematodes of the Shackleton Expedition. Contrib. to a Science of Nematology. I. Baltimore: Williams and Wilkins Co. 1914. 33 pp., illust.

127. Rhabditin. Journ. Parasitology, 1: 40-41, pl. 1914.
Reprinted. Rhabditin: Contribution to a science of nematology. 4 pp., pl.

128. North American free-living fresh-water nematodes. Trans. Amer. Microsc. Soc., 33: 69-134, 25 figs. 1914.
Reprinted. Contrib. Sci. Nematology. II [i.e., pp. 35-99] [Washington.]. 1914.

129. Approximate measurement of textile fibers. Science, N. S., 40: 683-684, 4 figs. 1914.
Reprinted, repaged.

130. Tests of the waste, tensile strength, and bleaching qualities of the different grades of cotton as standardized by the United States Government. U. S. Dept. Agric., Bull. no. 62. Washington: Gov't Print. Off. 1914. 8 pp. 1 fig.

131. Citrus-root nematode. Journ. Agric. Research, 2: 217-230, 13 figs. 1914.

1915

132. The Asymmetry of the Nematode Bunonema inequale, n. sp. Contrib. to a Science of Nematology. III. [i.e., pp. 101-112, 2 figs.] [Washington; privately published]. May 1915.

133. Selachinema, a new Nematode Genus. Contrib. to a Science of Nematology. IV. [i.e., pp. 113-116, 1 fig.] [Washington: privately published.] May, 1915.
(This series was extended to twenty-six numbers, Nos. V to XXVI, appearing from 1917 to 1935. The last one, "A Key to the Genera of Free-Living Nemas.") posthumously published, was edited by Margaret V. Cobb.

134. Some fresh-water nematodes of the Douglas Lake region of Michigan, U. S. A. (With M. V. Cobb.) Trans. Amer. Micros. Soc., 34: 21-47, illust. 1915.

135. [Note dealing with a new species of free-living nematode . . . aerophagous . . . nitrogen-fixing]. Journ. Parasitol., 1: 154-155. 1915.

136. A system for locating objects on microscope slides. Trans. Amer. Micros. Soc., 34: 189-190. 1915.

137. Tylenchus similis, the cause of a root disease of sugar cane and banana. Journ. Agric. Research, 4: 561-568. 2 figs. 1915.

138. Nematodes and their relationships. U. S. Dept. of Agriculture. Yearbook, 1914: 457-490, figs. 26-45. Washington, 1915.

Same: Yearbook separate 652. iii+pp. 457-490, figs. 26-45. Washington, 1915.

1916

139. Methods of Determining Length of Cotton Staple and Illustrations of their Application. A Paper read before The Nat. Assoc. Cotton Manufacturers at their 99th Meeting . . . [n. p.] 1916. 108+xx pp., 39 figs.

140. Notes on new genera and new species of nematodes. Journ. Parasitol., 2: 195-196. June, 1916.

141. Notes on filter-bed nematodes. Journ. Parasitol., 2: 198-200, 1 fig. June, 1916.

142. Masonry bases for the installation of microscopes and their accessories, including the camera lucida and the microscope camera. Trans. Amer. Microsc. Soc., 35: 9-22, 5 figs. 1916.

143. Diplogaster labiata; Diplogaster aerivora. In Merrill, J. H. and Ford, A. L., Life history and habits of two new nematodes parasitic on insects. Journ. Agric. Research, 6: 115-119, 121, 124. 1916.

1917

So far as is known, the foregoing list includes all that Dr. Cobb wrote prior to 1917, on all subjects. From that year on, the numerous technical contributions on nematodes are omitted, as well as newspaper articles, but several scattered ones on nematodes of general interest as well as the few papers on other subjects are listed. Many of those which are not listed here, over eighty titles, are major articles.

It is interesting that at the end of his career he published privately, on the 50th anniversary of writing it, the thesis which, at graduation in 1881, he submitted to the Worcester Polytechnic Institute. Had it been published then, it would have been his first scientific contribution. Beginning with mineralogy (mathematical

crystallography) and local flora studies in New England, he published later on whatever a pioneer plant and animal pathologist would encounter in Australia. In his later years, however, he was enabled to devote himself to what became his major field of interest, the classification, description, physiology and life histories of the nematodes.

144. Free-living Nematodes. Chapter XV in Ward, H. B., & Whipple, G. C., Fresh-water Biology, pp. 459-505, figs. 766-810. 1918

145. Estimating the nema population of the soil, with special reference to the sugar-beet and root-gall namas, *Heterodora schachtii* Schmidt and *Heterodoca radicicola* (Greef) Müller . . . U. S. Dept. Agric., Bur. Plant Ind., Agric. Tech. Circ. 1, 48 pp., illust. 1918.

146. Microtechnique; suggestions for methods and apparatus. Trans. Amer. Micros. Soc., 39: 231-242, figs. 1-6, 1920.

147. An approach to textile fibre research. Textile World Journal, 57, no. 6: 211, 421-422. 1920.
Reprinted without pagination. 1921.

148. The Thermolethe; a device for using hot fixatives. Trans. Amer. Micro. Soc., 46: 2. 1927.

149. Some recent aspects of nematology. Science, N. S., 73: 22-29. Jan. 9, 1931.
Extract from presidential address, American Society of Parasitologists, meeting at Des Moines, Iowa, 1929.

150. Mathematical Crystallography. Being a Thesis presented in Partial Fulfillment of Conditions for Receiving the Degree of Bachelor of Science from the Worcester Polytechnic Institute, June, 1881. Washington: Privately published. 1931. 43 pp., 22 figs.

151. The use of live nemas *(Metoncholaimus pristiurus)* in zoological courses in schools and colleges. Science, N. S., 74: 489. Nov. 13, 1931.
Also in: The Collecting Net, Aug. 29, 1931. Woods Hole, Mass.

152. The English Word "nema". Journ. Amer. Med. Assoc., 98: 75. 1932.

BOTANICAL GARDENS OF THE UNIVERSITY OF MICHIGAN, AND THE NEW DIRECTOR, DR. A. GEOFFREY NORMAN*

Elizabeth Sutherland Trow

Directed by Dr. A. Geoffrey Norman, Professor of Botany, the Gardens staff performs a variety of services for the University. The purpose of the Botanical Gardens, according to Professor Norman, is "to support all botanical interests on campus by providing living plants and collections for undergraduate and graduate instruction and for research by students and faculty."

The Botanical Gardens was first started in 1897, and since has changed location twice. Now situated off Packard Road on Iroquois Drive, it has about 40 acres of land and 18,000 square feet of greenhouse space. Previously it owned over 50 acres, but a slice was cut off a year ago by the right of way for a new industrial highway without making provision for adding other immediately adjacent land by way of replacement, which had been urgently requested by the Director.

Harley H. Bartlett, Professor Emeritus of botany, directed the Gardens for 36 years. The Assistant Director for nearly all that time was Dr. Frieda C. Blanchard, who retired last June. Professor Norman, who has been Director since July, 1955, is assisted by Dr. P. A. Hyypio and Dr. P. B. Kaufman, Research Associates and part-time instructors in botany.

Walter F. Kleinschmidt has been resident superintendent of the Gardens for about 20 years. On the staff of eight gardeners are Harold Allen, Harvey Allen, Albert Bek, Forrest Cochran, Paul Gensley, John Ludwig, Louis Ludwig, and Donald Trout.

Members of the Michigan Botanical Gardens Association will naturally wish to know more about the new Director, who took charge of the Gardens in July 1955 when Mr. Bartlett entered upon his final sabbatical leave, before retiring a year later.

Professor Norman came to the University in 1952 as a research biochemist and Professor of Botany in the College of Literature,

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*Based upon an article in The University [of Michigan] Record, Vol. 12, No. 1, pp. 4, 5.

Science and the Arts; is currently directing researches in the field of plant and soil relationships under a $100,000 grant from the Ford Motor Company Fund. He was born November 26, 1905 in Birmingham, England. While attending King Edward's School, a secondary school in Birmingham, Professor Norman became interested in biological sciences and has "stayed with it" ever since. He received the degrees of Bachelor of Science in 1925 from the University of Birmingham and Doctor of Philosophy in 1928.

In 1930 Dr. Norman came to the United States as a Rockefeller Fellow at the University of Wisconsin. Here he did postdoctoral work in agricultural bacteriology, and was granted the N. S. in this field in 1932. After serving as Research Associate at Wisconsin, he returned to England, where he became Doctor of Science in 1933 at the University of London.

Remaining in England, Professor Norman was biochemist in charge of the Biochemistry Section, Rothamsted Experimental Station, Harpenden, Herts, England, from 1933 to 1937. He returned to the United States in 1937, and was appointed Professor of Soils at Iowa State College and also Research Professor at the Iowa Agricultural Experiment Station, positions which he held until 1946. During the war period, however, from 1943 to 1945 he was Consultant assigned to the Chemical Corps of the U. S. Army, in Washington, D. C. From 1946 to 1952 Professor Norman became Biochemist and Division Chief for the Chemical Corps Biological Laboratories at Camp Detrick, Maryland. He became a member of the U. S. Air Force Reserve as a Colonel in 1949.

Professor Norman belongs to numerous organizations. In 1956, he was Vice-President of the American Society of Agronomy, and became President in 1957. He is also a member of the Biochemical Society, the Society of American Bacteriologists, the American Society of Plant Physiologists, and the Iowa Academy of Science. He is a member of the Division of Biology and Agriculture of the National Research Council in Washington, D. C.

As chairman of the Committee on Effects of Atomic Radiation on Agriculture and Food Supplies, Professor Norman recently took part in a broad, nationwide study by the National Academy on the biological effects of atomic radiation.

Throughout his career, Professor Norman has written "well over a hundred" scientific and research papers for technical journals.

He was married on September 5, 1933 to Marian Esther Foote of Huron, South Dakota. They have two children, Anthony Westcott, born January 19, 1938 and Stephen Trevor, born March 16, 1942. His home is at 2132 Brockman Blvd., Ann Arbor, Michigan.

One of the chief activities of the Botanical Gardens over the years has been the growing of plants for identification in connection with the field work of faculty and students.

Botanical expeditions have added greatly to the Gardens' collections from time to time, Professor Norman points out. To cite an example, Mr. Lems, doing research on the ecology of the Canary Islands, sent back many specimens.

A laboratory course in applied botany meets regularly at the Gardens, and other botany classes frequently visit the greenhouses to observe collections of living plants. In addition to class trips, the Gardens receives many visitors each year. Last May about 500 members of school, club, and University groups came on tours, Professor Norman estimates. For easy identification, all plants in the greenhouses or outside are marked with a zinc label, but a new type of laminated plastic label bearing descriptive information will be added this fall to many of the greenhouse plants of special interest.

Greenhouse facilities include planting rooms where seedlings are set out, rooms for tropical and semitropical plants, a cactus room, space for the general collections and for the propagation of the plants studied by botany classes.

There are many special out-door collections, even including a planting of telephone poles for a study (supported by the Detroit Edison Company) of resistence to rot-producing fungi, conducted by Dr. Dow V. Baxter, Professor of Forest Pathology and of Botany.

Although it has a close relationship with the Botany Department, the Botanical Gardens is an autonomous unit.

Professor A. Godfrey Norman, Director of the Botanical Gardens, University of Michigan.

To keep track of all the plants in the collection, a careful accessions system is necessary. Each new plant is recorded and given a number. A card is made for it containing all known information about where, when and how it was acquired. Cards of current plants are kept in a "live" file.

Although encouragement of expeditionary activities has been well to the front in the past of the Botanical Gardens, genetics and plant breeding have always been greatly emphasized. For example, 5,000 or 6,000 evening primroses are grown annually for research in genetics carried on by Dr. Erich E. Steiner, Assistant Professor of botany.

A perennial garden of types of cultivated hibiscus is used in a study of color inheritance by Dr. Edwin B. Mains, director of the University Herbarium.

The Botanical Gardens will develop some new projects as a part of the independent research program directed by its own staff, as well as "servicing" the special collections maintained for individual investigators. Professor Norman also hopes to start some new outside plantings, including a bulb garden which will have flowers blooming continuously from spring to fall, a genetic garden, and a collection of flowering shrubs hardy in the Michigan climate.

Something new is the growing of ragweed for the study of pollen release and travel directed by Dr. E. Wendell Hewson, Professor of Meteorology. Plants are also grown at the Gardens for Professor Norman's research on root physiology at the Plant Nutrition Laboratory.

Of course the growing of plants for use in physiological research and class work has always been a specialty, and this requires no little knowledge and experience on the part of Mr. Kleinschmidt. In order to have two-foot sunflower plants by November 1, for example, one must know exactly when to plant them.

ABOUT THE PROJECT FOR A NEW FLORA OF MICHIGAN, AND EDWARD G. VOSS, WHO IS WORKING ON IT*

Elizabeth Sutherland Trow

For a good many years botanists at the University of Michigan have looked forward to the preparation of a new Flora of Michigan. There has never, however, been any adequate provision for carrying out such a project, since it had to be done in connection with other duties by staff members who were fully occupied otherwise. Still, there was a committee which carried on various activities of collecting and compilation of data for a flora. The first chairman of this committee was H. H. Bartlett, who was succeeded by Dr. Rogers McVaugh. Two of the most notable workers on the local flora were Dr. J. H. Ehlers, who taught systematic botany from 1915 until his retirement in 1939, and Frederick J. Hermann, now botanist with the U. S. Department of Agriculture, a most enthusiastic student of the whole flora of Michigan but especially of the Upper Peninsula, and a recognized authority on the difficult sedge family, the Cyperaceae. No one else at the University of Michigan had contributed so largely as these two until Dr. Edward G. Voss entered the local flora field, and presented an extensive and critical study of the plants of Emmet and Cheboygan Counties as his doctoral dissertation. In order not to lose the impetus provided by his extraordinary activity, the present Chairman of the Department of Botany, Professor Kenneth L. Jones, undertook to stabilize the too insecure "Flora of Michigan" project by the appointment of Dr. Voss for five years as Research Associate, with the specific duty of producing a manuscript for publication at the end of that period. Dr. Voss has entered upon his duties, and has likewise consented to serve as a third member of the editorial staff of the Asa Gray Bulletin.

So Dr. Voss expects to spend five years on the job of preparing a handbook on state flora which will be both accurate and intelligible to laymen. The book is scheduled for publication in 1961 by the University Press.

Planned for use in schools, colleges, libraries, and by individuals who like to identify plants, the handbook will include not only native Michigan flowering plants and ferns but also those which have been introduced and have become established.

*This article is a slight modification of one which appeared under the title "Michigan Flowers to be Described" in the University [of Michigan] Record, Vol. 12, No. 4 (p. 8).

Dr. **Edward G. Voss, who is engaged in writing** a new Flora of Michigan, which, it is planned, will be ready for publication in 1961 by the University of Michigan Press. Dr. Voss is also to be Editor of the Asa Gray Bulletin.

Line drawings are planned to illustrate each major group of plants, and to show certain details which are difficult to describe. In addition, small maps will indicate the distribution of the plants by counties following the precedent of the late C. C. Deam's Flora of Indiana.

Dr. Voss is doing much of his research in the University Herbarium, which has approximately 300,000 flowering plant specimens, including one of the most complete collections of identified Michigan plants. He is also borrowing specimens from other institutions, including Wayne State University, Michigan State University, the Cranbrook Institute of Science, Aquinas College, and Albion College.

Because some areas of Michigan have not been thoroughly explored by botanists, Dr. Voss and his assistant, James Wilson, plan a series of field trips starting in the spring of 1957 to gather additional material from several central and southern counties of the state, which have been especially neglected. Several local amateur botanists have done excellent local flora work in the state, and also not a few former and present students at the University and other state institutions. The contributions of all will be

appropriately recognized by Dr. Voss, probably in historical articles and notes for the Asa Gray Bulletin.

The projected Flora of Michigan will not be the final word on Michigan plants, according to Prof. Kenneth L. Jones, chairman of the Botany Department, because new plants are continuously being found in all areas. For example, Dr. Voss reports that he has collected plants in Emmet and Cheboygan Counties for the past 12 years and each year has found kinds previously unknown in that region. Revisions are planned from time to time to keep the handbook up to date.

Money for the project has been provided from Faculty Research Funds of the Graduate School, although Professor Jones expects the book to pay for itself. Supervising the work is a faculty committee composed of Professor Jones; Prof. Edwin B. Mains, director of the University Herbarium; Prof. Rogers McVaugh, curator of vascular plants in the Herbarium; Associate Prof. Elzada U. Clover, associate curator in the Botanical Gardens; and Assistant Prof. Warren H. Wagner, Jr.

Dr. Voss received the degrees of Master of Arts in biology from the University in 1951 and Doctor of Philosophy in botany in 1954. He has published many articles on plant life, of which the most recent is a history of botany in Emmet and Cheboygan Counties. He is likewise one of the most active entomologists in Michigan. For the past two years he has been a research assistant in the Metabolism Research Laboratory of the University Hospital.

EDITORIAL NOTE. — It has been found impracticable to promise publication of the Asa Gray Bulletin on a regular quarterly basis, but volumes consisting of approximately 400 pages will continue to be issued. Subscriptions will be entered for entire volumes, regardless of publication date, rather than for the issues of a year.

The two remaining issues of Vol. III will be sent to press as soon as possible. One of the forthcoming issues will consist of a single article, publication of which should not be considered as setting a precedent for any change in editorial policy, since the extra cost of publication of the special number has been covered by gifts. Other future numbers will be as diversified in content as in the past.

DR. WALTER N. KOELZ AND THAKUR RUP CHAND, COLLABORATORS IN ASIATIC RESEARCH, BOTANICAL GARDENS AND MUSEUM OF ZOOLOGY, UNIVERSITY OF MICHIGAN*

Elizabeth Sutherland Trow

It is believed that readers of Dr. Walter Koelz's Persian Diary, begun in this issue of the Asa Gray Bulletin, may wish to know something about his zoological as well as his botanical activities.

From one man's travels in Iran, Afghanistan, and India have come 25,000 bird skins purchased last spring by the University. Collected over a 14-year period by Dr. Walter N. Koelz, collaborator in Asiatic research for the Botanical Gardens, and the Museum of Zoology, these birds are the most important single acquisition ever made by the Museum of Zoology, according to Prof. Josselyn Van Tyne, curator of birds. Nevertheless they represent only part of Dr. Koelz's ornithological work, for his collections are also largely represented in the Chicago Museum of Natural History in Chicago. They have been the subject of extensive publication by ornithologists of the American Museum of Natural History, New York, and many of the new races have been described by Dr. Koelz himself in a publication of the Institute for Regional Exploration of Ann Arbor.

Especially valuable are 15,000 birds from the province of Assam in eastern India near the Burmese border, where Dr. Koelz spent several years with his Tibetan assistant, who is also Collaborator in Asiatic Research in the Michigan Botanical Gardens, the Thakur Rup Chand. ("Thakur," Dr. Koelz explains, is an Indian title.) This province is particularly interesting to scientists because each range in the Assam Mountains has a distinct bird fauna. The same species may have variations in color or form within a few miles, for no known reason. To show these minute differences, Dr. Koelz regularly collected a series of specimens of each species.

This is the first really adequate representation of the birds of Assam, and, Dr. Koelz believes, is likely to be the last such collection that can ever be brought from that area. Current political

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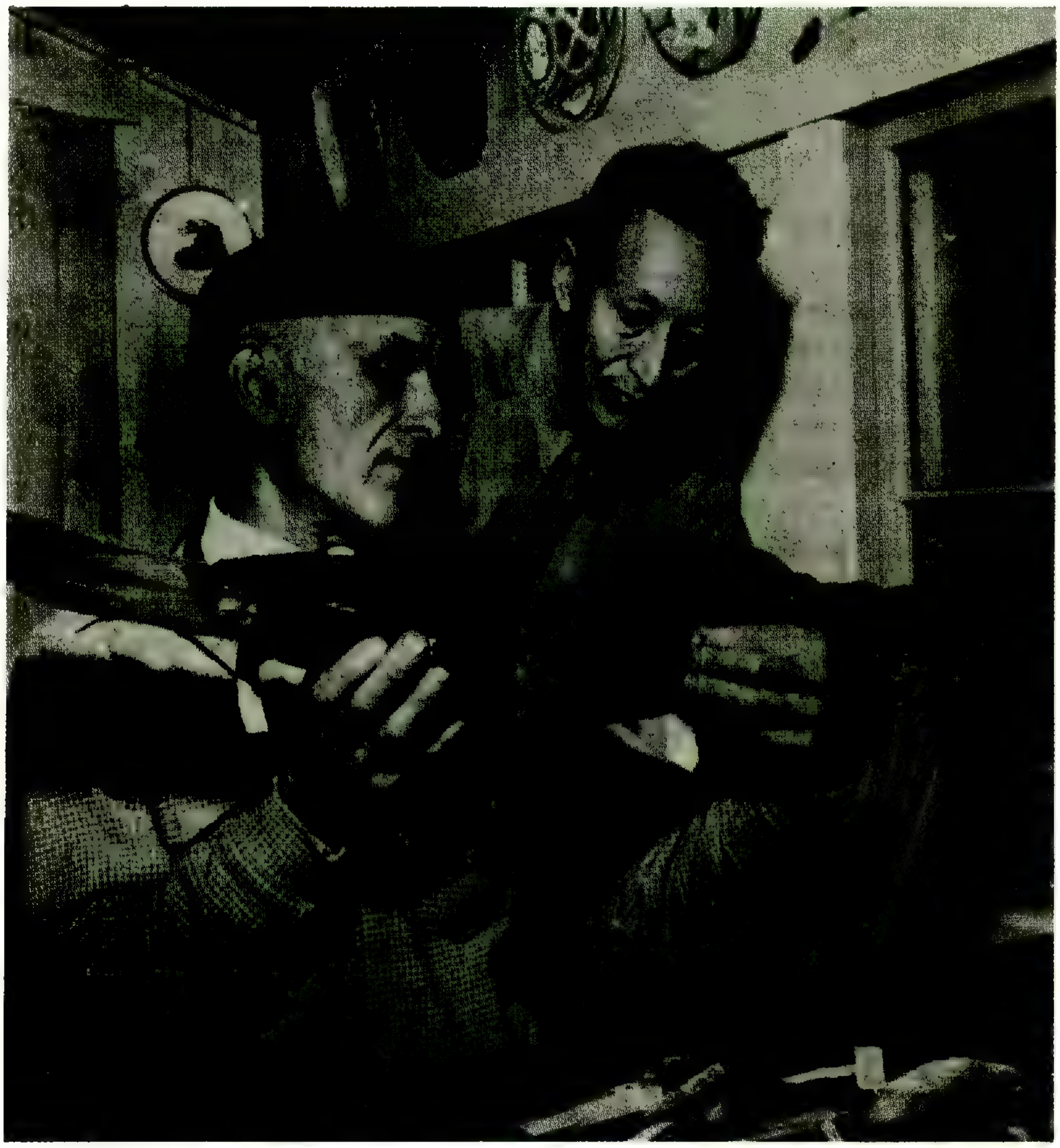
*This article is somewhat modified from one which appeared in "The University [of Michigan] Record, Vol. 12, No. 4 (pp. 4, 5) under the title "Museums' Collector of Asiatic Birds is World Traveller and Scientist."

conditions make it impossible for scientists to go there in the foreseeable future, and a swelling human population is destroying the natural cover for birds very rapidly. Species which Dr. Koelz collected in numbers are now disappearing, and some may already be extinct in the area, for the extermination of the last remnants of primary vegetation naturally destroys whole ecological groups of animals as well as plants.

Of major importance in the Koelz Collection are 125 type specimens of "new" kinds of birds. The type specimen is the final reference for ornithologists identifying later collections or studying related species.



Dr. Walter Koelz and Thakur Rup Chand, Collaborators in Asiatic Research, at his home, examining a pheasant collected in the Himalayan Mountains.

More than a dozen of the rarest birds in the world are included in the collection, such as the Indian honey-guide, which probably no other scientist has seen alive, and the largest heron in the world, of which only a single specimen can be found in all the other museums in America.

On their expeditions, Dr. Koelz, the Thakur Rup Chand, and their helpers prepared the specimens the same day the birds were shot. They were sometimes able to prepare 100 specimens in an evening, Dr. Koelz reports. Each specimen has a label telling where and when it was obtained, and whether it is male or female.

The Koelz Collection was being studied up to the time of his death by the late lamented Professor Van Tyne and by Assistant Prof. Robert W. Storer. All the larger birds have been identified and catalogued, and the scientists are now working on the smaller species.

Dr. Koelz has published several articles on this collection, and plans to write an account of the birds of Assam. He is working with Dr. Philip S. Humphrey, research associate in the Museum of Zoology, on details of certain families of birds. Dr. Humphrey, unfortunately for Michigan, is about to transfer to Yale.

This new acquisition is just a part of the Museum's bird collection, now numbering over 143,000 study skins, a great many of which have been contributed by Dr. Koelz over the years! Ornithologists from many areas have already come to work with the specimens, gathering fundamental information about new species and the evolution of birds. The collection has been helpful to ornithologists and museums in the identification of birds, as well as providing material for individual research projects by students, faculty members, and scientists from other universities. It is also used as illustrative material in extension courses and lectures.

Birds, strangely enough, are a sideline with Dr. Koelz. He received the Doctor of Philosophy degree in zoology at the University in 1920, and, then chiefly interested in ichthyology, at the same time was the first curator of fish in the Museum of Zoology. As associate biologist of the U. S. Bureau of Fisheries from 1919-27, he investigated the Great Lakes commercial fisheries. He has also been naturalist of the Macmillan Expedition at Arctic Greenland, fisheries investigator for the Institute for Fisheries Research, and plant explorer for the U. S. Department of Agriculture. On the last assignment he gathered thousands of plant seeds from the Near East, as well as 30,000 herbarium specimens.

Dr. Koelz first went to India in 1930. Since then he has collected in India, Iran, Afghanistan, and Tibet, sending the University many botanical collections and much valuable material in the field of ethnology and art. In 1934 he gave the Museum of Anthropology an important collection of Buddhist paintings and sculpture, ceremonial objects, jewelry, ornaments, and other items of Tibetan and Indian origin, including the finest collection of Tibetan temple banners in existence, as well as textiles of Kashmir and Persia. He has in manuscript form an analytical study of the collection of Persian shawls he made for the University.

In recognition of his achievements in introducing economic plants of Asia for use in breeding new agricultural varieties, Dr. Koelz was awarded the Frank N. Meyer Medal of the American Genetic Association, a medal which has been awarded to only 14 other Americans.

Since his return to this country in 1953, Dr. Koelz has been living in Waterloo, where his current project is the remodeling of his boyhood home. The Thakur Rup Chand has joined him there and is still working as a collaborator in Asiatic research for the Botanical Gardens, organizing a vast collection of plants made for incorporation with the Herbarium of the University of Michigan.

EDITORIAL NOTE. — Two years ago the Asa Gray Bulletin planned to publish a series of notes, with photographs if possible, of the largest and most notable specimens of each species of American trees. Some material has been accumulated, publication of which will soon begin, but there should be many more contributors than there have been. It has seemed that the location of trees of unusual size and longevity might be equivalent, in at least some instances, to the selection of trees of unusually valuable genetic constitution, especially worthy of propagation.

More recently the Michigan Botanical Club has undertaken to locate the largest, most unusual, and historically most interesting trees in Michigan. All who are interested in contributing information should communicate with Miss Margaret Haigh, 36910 Ann Arbor Trail, Livonia, Michigan.

TO BE EXPECTED IN FORTHCOMING ISSUES

Botanizing in the Tahquamenon Area, by Alexander H. Smith

Persian Diary, II, by Walter N. Koelz

An Autobiography for his Family and Friends, by the late Cornelius L. Shear

Glimpses of the Natural History of Koror, by Peter J. and Alma Hill

Ekman, Botanical Explorer in the West Indies, by Siri Von Reis

Expedición Oñate, by John A. Nystrom, translated by Siri Von Reis

Biographical Sketches of Charles C. Deam, Alice Eastwood, Ray C. Friesner, and Louis H. Jordal

Botanist's Visit to Mount Sisipitan, by José Vera Santos

Ethnobotany of Popcorn, by Volney H. Jones

Collecting in the Aleutians, by Walter J. Eyerdam

Observations on the Edwards Plateau, by Winifred O. Moore

The Everett G. Logue Collection of Hybrid Oaks, by H. H. Bartlett

Botanical Publications on the Ryukyu Islands, by Egbert H. Walker

Notes on the Flora of Agattu, by Harvey Alfred Miller

Sphagnum Flora in the Vicinity of Douglas Lake, Michigan, by Bodil Lange

The Nucleus of a Library: the Gray Collection, General Library, University of Michigan, by Russell E. Bidlack

Science vs. the Military: Dr. James Morrow and the Perry Expedition, by A. Hunter Dupree

The Glastonbury Thorn at the Washington Cathedral, by Theodore C. Taylor

Three articles on Michigan florulas, by Marjorie T. Bingham

Continuation of articles on the representation of various families in the flora of Michigan, by C. M. Rogers.

THE ASA GRAY BULLETIN, NEW SERIES.--An irregularly published journal of which four numbers constitute a volume, devoted to more or less informal communication among the members of the three organizations listed below and our subscribers in general. Progress reports of current field, garden, and herbarium work, with readable and relatively non-technical articles in the fields related to systematics, botanical history, biography, and bibliography, will be preferred. There will be special emphasis upon preparatory work for a new "Flora of Michigan". Free use will be made of letters to the Editors (if released for publication by their writers) and of current news notes regarding botanists.

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Address subscriptions to Miss Hazel Bartlett, 1601 Brooklyn Ave., Ann Arbor, Michigan. Subscription price for Voume I (if available) is $6.00; single copies of Nos. 2, 3, and 4, $1.00 each. Vols. II and III, $3.00 each; single copies (if not breaking volumes) 75¢ each.

THE GRAY MEMORIAL BOTANICAL ASSOCIATION, FOUNDED 1887.--This organization sponsored publication of early volumes of the Asa Gray Bulletin. Later it issued a mimeographed "Bulletin". Its object is to commemorate the life and botanical work of Asa Gray and to assist its members in botanical activity by furthering friendly correspondence and cooperation among them. Interested persons are invited to communicate with the Permanent Secretary, Professor R. Lee Walp, Department of Biology, Marietta College, Marietta, Ohio.

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MICHIGAN BOTANICAL CLUB.--The membership is about 283, made up of persons interested in the Michigan flora, nature-study, wild-flower protection, preservation of natural areas, and conservation. It has members at large and the following chapters: Southeastern, Bay County, Marquette, Wild-Life (Houghton). For information address Mr. Paul W. Thompson, 17503 Kirkshire, Birmingham, Michigan, or Mrs. Robert Frehse, 506 W. Maplehurst St., Ferndale, Michigan.

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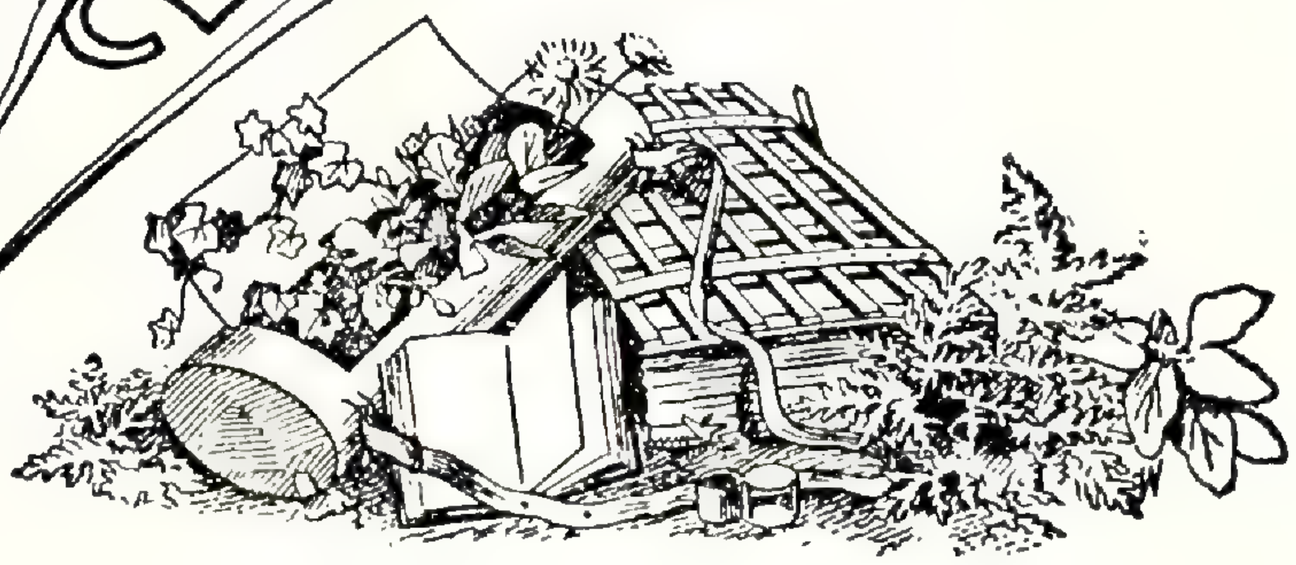
The Gray Herbarium Bulletin



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THE GRAY MEMORIAL BOTANICAL ASSOCIATION
and the
BOTANICAL GARDENS ASSOCIATION
OF THE UNIVERSITY OF MICHIGAN
by
Rogers McVaugh

C O N T E N T S

Japanese Botany During the Period of Wood-Block Printing

Harley Harris Bartlett & Hide Shohara 289

ANN ARBOR, MICHIGAN

EDITORIAL NOTE.--With this issue we bring to a close the third volume of Asa Gray Bulletin, new series. The first number of this volume was issued 10 June 1955, and the second number 12 July 1957.

We have no definite plans for additional volumes, and we cannot accept new subscriptions. If the demand warrants, however, and if funds become available, we shall be glad to consider the possibility of continuing publication.

Editorial policy in the first three volumes was a very simple one: We insisted that articles be interesting and readable, and that in addition they contain some useful botanical information. We felt that in this way the Asa Gray Bulletin served a useful purpose in the botanical community.

The moving spirit in the new Asa Gray Bulletin was Harley Bartlett, to whose memory we gratefully dedicate this volume. His infectious enthusiasm, his wide variety of interests and acquaintances, his ability to make lucid and readable prose out of the merest scraps of information, his unfailing optimism and his wholly unassumed pleasure in each succeeding issue as it was published, made working with him an inspirational task. Every article in the new Asa Gray Bulletin bore the stamp of his personality.

In his last years Professor Bartlett spent almost all his working hours in the preparation of an annotated bibliography on Fire in Relation to Primitive Agriculture and Grazing in the Tropics. After the publication of the first two volumes (in 1955 and 1957 respectively), he was much gratified by the very considerable demand for them. Volume I soon went out of print. Professor Bartlett planned to complete the work in 5 volumes but only the first 2, and Volume III, soon to be issued by the University of Michigan, had been completed at the time of his death.[1]

Even in the midst of his preoccupation with the bibliography, he continued to work at intervals on a project he had envisioned many years before--a project that had become timely in 1954, the centennial year of Commodore Perry's visit to Japan. In this work on

[Continued on inside back cover]

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[1] A sensitive and appreciative account of his life and work, by his colleague and former student, Edward G. Voss, has recently been published in the Bulletin of the Torrey Botanical Club, Vol. 88, pp.47-56. 1961

THE ASA GRAY BULLETIN

NEW SERIES

VOLUME III

Edited by
Harley H. Bartlett and Rogers McVaugh

A Botanical Quarterly published in the interests of the Gray Memorial Botanical Association, The Botanical Gardens Association of the University of Michigan, and the Michigan Botanical Club

ANN ARBOR, MICHIGAN 1955-1961

Harley Harris Bartlett
Ann Arbor, Michigan, 1938

Dedicated to the

Memory of

HARLEY HARRIS BARTLETT

March 9, 1886 -- February 21, 1960

For the unsparing aid and encouragement that he gave equally to all; his infinite curiosity and enthusiasm, and the extraordinary capacity of his versatile mind; for his gift of tongues and for his generous heart; his prodigious industry; his magnificent disregard of time and the limitations it imposes; for his intolerance of sham and his bold support of the truth as he saw it, we remember him with love and admiration.

ERRATA, Vol. III, Nos. 1 and 2:

p. 4, line 25: for "Goft" read "Gift".

p. 14, line 6 from bottom: for "sumbol" read "symbol".

p. 22, line 5: for "wo" read "two".

p. 32, line 18: for "Great Lakes ship captain" read "Chicago physician".

p. 88, line 8: for "Fallas" read "Fallass".

p. 102, last line: for "disfugured" read "disfigured".

p. 109, line 14 from bottom: for "wordly" read "worldly".

p. 117, line 12: for "persprective" read "perspective".

p. 199, line 6 from bottom: after "6." read "L. striatum".

p. 204, line 1: for "(NDL," read "(ND),".

p. 204, line 17: for "if" read "is".

p. 227, delete last line.

p. 234, delete last line.

p. 251, line 14: for "legand" read "leg and".

p. 274, line 11: for "N.S." read "M.S.".

p. 276, line 1 of legend beneath picture: for "Godfrey" read "Geoffrey".

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JAPANESE BOTANY

DURING THE PERIOD

OF WOOD-BLOCK PRINTING

By Harley Harris Bartlett

& Hide Shohara

Part I. An Essay

On the Development of Natural History, Especially Botany, in Japan; On the Influence of Early Chinese & Western Contacts; On Japanese Books & Wood-block Illustration.

Part II. An Exhibition Of

Japanese Books & Manuscripts, Mostly Botanical, Held at the Clements Library of the University of Michigan, In Commemoration of the Hundredth Anniversary (1954) of the First Treaty Between the United States and Japan.

To
Rachel McMasters Miller Hunt
with affection and appreciation

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PART I

An Essay on the Development of Natural History, Especially Botany, in Japan; On the Influence of Early Chinese & Western Contacts; On Japanese Books & Wood-block Illustration

INTRODUCTION

The American Expedition of Commodore Perry to Japan, a century ago, resulted in the signing of the first treaty between the two nations, on the thirty-first of March 1854, and subsequent treaties within the following twenty years were soon to bring about the opening of Japan to commercial and cultural relations with all countries. With rapid cultural interchange came a gradual fading away of many age-old aspects of Japan. A centennial exhibition at the Clements Library of the University of Michigan, commemorating the signing of the treaty, illustrated the development of Japan's literature of natural history during the long Edo period, two and a half centuries of isolation, during which outside contacts were almost exclusively with Holland, China and Korea. For this exhibition the senior author loaned a collection of books and manuscripts which had been gradually accumulated during the years following 1918. The cataloging of the collection began with preparing rather detailed descriptive cards for the exhibits, which were then expanded to form Part II of the present publication. Part I of the present work provides a background for the better understanding of Part II, which is an elaborately annotated catalogue of the items exhibited at the Clements Library.

The mainly botanical book collection was not too highly specialized to illustrate well many aspects of the cultural, technological and artistic history of old Japan, and was not without interest for political history as well. It was brought together with the idea of including creditably illustrated representative books in every class of pre-Meiji (or at any rate old-style) Japanese literature that had any bearing on plants. It therefore contains works of mixed subject matter, such as old encyclopedias, and some that would be classified as geography, history, or exploration, because they are of minor or incidental botanical interest. The latter are mostly on Japan's explorations to the northward and are historically important in the history of moves to consolidate her hold on the loosely held northern possessions. In the Edo period down to the restoration of imperial rule (1868) even the great island of Hokkaidō (then Ezo) was inadequately

explored and only thinly colonized. Books about the North and its Ainu inhabitants had the same interest to the Japanese that books about the Far West and the Indians had to Americans of the same period.

Russian colonization had swept eastward across Siberia and had moved on to Alaska and the Aleutians. To the southward it had reached to coastal outposts of Manchuria at the mouth of the Amur River, a region then known, in books of travel, as Eastern Tartary. It was destined to overflow the whole coastal part of Manchuria, now Russian, down to Korea. It menaced Sakhalin and the Kuriles, also now Russian. Most Japanese books on the North have some botanical bearing, as well as being highly prized sources for the ethnology of the Ainu.

Our special botanical exhibition demonstrated, as well as any other would, the development of Japanese book publication during the Edo period (except for the first sixty years), the dominance, at first of cultural borrowings from China, the influence of the popular ukiyo-e art on book illustration, the gradual infiltration of European ideas by way of the Dutch at Nagasaki, adding to what the Portuguese and Spanish Jesuits had accomplished, and the establ ishment long before the Meiji period of a rich and diversified indigenous literature. After the restoration of imperial rule the Westernization of education, science, art, literature and technology was in full swing twenty-five years after Perry's expedition, and was to reach its climax within fifty years. In the history of science in general and of botany in particular no precise date can be set, but the relinquishment of the old and adoption of the new was especially evident about 1877, a quarter of a century after the arrival of the Perry mission and the year of the establishment of the University of Tōkyō.

Much of the traditional culture of Old Japan, of course, still lingers or has been revived. Therefore a hard and fast date limit has not been set for inclusion of books in the exhibition, and a few items have been chosen to show beginnings of definitely Western styles in bookmaking, illustration, etc. Nothing prior to 1666 is shown because nothing is available. Books of the first half of the 17th century, and, of course, the still earlier ones have become very rare. Most of the books shown, however, are older than the date of the treaty between Japan and America (1854).

ON COLLECTING JAPANESE PRINTS AND BOOKS

The reader of this descriptive account of the centennial exhibition may be interested in how such a collection came to be made. As a high-school boy and later as assistant in biology and chemistry at the old Shortridge High School in Indianapolis (1899-1904) the

collector was well acquainted with Miss Roda Selleck, * a vivacious little lady who taught art with vast enthusiasm and enterprise. Miss Selleck was indefatigable in preparing interesting exhibits in her class room, for which her Japanese prints frequently supplied material. Miss Selleck became, probably about 1890, an enthusiast for Japanese popular art, and as opportunity arose she collected single-sheet wood-block color prints and a few old-style illustrated books. The latter, mostly of the sort called "kachō," containing prints of birds and flowers, she had taken apart in order to display the pictures separately, and some of these were destined never to be reassembled. After her death the writer was given some of her chrysanthemum prints by her niece, Mrs. Roda (Selleck) Pollock, the wife of Professor James B. Pollock, a botanist and colleague at the University of Michigan. Mrs. Pollock had inherited a number of color prints, among them the chrysanthemums, of unknown source, bibliographically, but undoubtedly some that Miss Selleck had periodically displayed. To Mrs. Pollock also came Miss Selleck's copy of Josiah Conder's folio volume of 1891 entitled The Flowers of Japan and the Art of Floral Arrangement in the original paper covers, the pioneer book in English on ikebana, or flower arrangement, illustrated by colored plates done fromppaintings by Japanese artists and printed from wood blocks. In the official inventory of Miss Selleck's estate the administrator placed a total value of 50¢ on "a chest containing Japanese art reference material" and $10.00 on "a lot of 59 books." In this lot was the very rare folio by Conder (16). The prints from the "chest" are now scattered among family and friends.

*Roda Selleck was a contemporary of David Starr Jordan, later President of Stanford University, during the time that he taught Botany and Zoology at Shortridge, and was very active in the Indianapolis Nature Study Club. One of her earliest enthusiasms was for Botany. Jordan held Miss Selleck in high regard and was one of the contributors to a fund for establishment of the Roda E. Selleck Memorial Scholarship at Butler College, where she had been a member of the summer session staff. Miss Selleck organized the first sketching club in Indianapolis, and was active in the development of the John Herron Art Institute of Indianapolis. She taught art in the Shortridge High School for many years. Many artists and commercial designers started their careers in her high-school studio.

The senior author's collection of Japanese prints and books, displayed in the Clements Library exhibition, was begun in 1918. He was asked before visiting the Orient in that year to pick up some prints in Japan for his friend Professor DeWitt Parker, who was then lecturing and writing chiefly about aesthetics and had become greatly interested in the popular art of Japan. So the few hours at each Japanese port, on the outward voyage and returning, were largely spent in the book shops. A few old illustrated books were acquired, and plenty of prints, for the book shops of Kōbe, Yokohama, Tōkyō and Nagasaki then offered the traveller great piles to rummage through. Some were found that Parker would surely like and others that satisfied the collector's own taste for natural history and landscape, or that were based on myths, legendary tales and history.

The little that was retained of these earlier gatherings was a small group of landscapes by Hiroshige and Hokusai, and three or four odd volumes, for nearly everything else was quickly given away. A group of quaint old maps was given to the Library of the University of Michigan. The prints of Hokusai, "Old-Man-Mad-About-Painting," appealed to the collector as much as those of Hiroshige, but were scarcer and more expensive. (Japanese dealers hardly expected an American to be interested in any artists except these two, and priced their prints accordingly.) It was impossible to find the flower and bird prints of either. After being so lucky as to pick up a few odd parts of Hokusai's Manga, the published notebooks reproducing by wood-cuts hundreds of miscellaneous little sketches, including some few pictures of plants, the collector gave them away (expecting to get a complete set eventually) but was never able to replace them, except by a reprint edition of 1912 (Exhibit No. 89).

More specialized and intelligent gathering began in 1926, when the collector was in Japan as a delegate of the University of Michigan to the Pacific Science Congress. Professor Shirai Mitsutarō (70) had written a captivating chapter for the preliminary publication of the Congress entitled "A Brief History of Botany in Old Japan." That stimulated renewed searching for old botanical prints and books, but the great earthquake of 1923 had greatly reduced the abundance of such things. Still, a couple of good accessions were then secured and others in 1935 and 1940, some of them dog-eared, wormed and soiled, but nevertheless very desirable. Shirai's essay crystallized collecting objectives as follows: (1) to secure those illustrated works considered as historically the more important in the Natural History period of Japanese Botany, (2) to get one or more books by each of the more eminent old-time naturalists, and (3) to make the collection representative of every type of Japanese books that touched upon plants. It was soon found that there were a few serious elderly

Japanese collectors of the same sort of books. These, however, were utterly disdained by the earnest young people who crowded the book-stores at night to study, sometimes so densely that it was hard for a genuine customer to get in. It seemed to be an unwritten law of the book-sellers that any student who wanted to read badly enough to stand up all evening was welcome to do so. It wasn't a matter of browsing, with the idea of buying, for there seemed to be little of that. Each student eagerly seized upon some volume and stood stock still in one place, reading intently. Out of politeness and to exercise his school-book English he could be diverted long enough to explain to the proprietor that here was an American traveller who actually seemed to want to buy pre-Meiji books about plants, quite incredible as that might seem. The collector did not even have command of enough Japanese to express proper gratification when led to a pile of old books, or parts of old books, for many were incomplete. In the old days Japanese books were published in many thin volumes (maki) with flexible paper covers, and in the shops one got the impression that more sets were incomplete than complete.

Old experience in looking for Hokusai's Manga in 1918 had still not taught the lesson that a "cripple" might be better than nothing at all, and so odd parts of several works were turned down that are now remembered too vaguely to guess at an identification but subsequently were thought to have been very desirable. Also snobbishly and resolutely refused were some beautiful reprints that were (because they were then new) never available later. So the collector's hunting in Tōkyō, Yokohama and Kōbe was not too profitable.

The next collecting actually in Japan was in 1935, when a few hours yielded a couple of trophies, including the Ka-i of Yonan Shi, and Ono Ranzan (Exhibit No. 22). Short stops in transit in 1940 and 1941 although not entirely unproductive, especially the latter, for the "President Coolidge" was on her last regular run before the war broke. Many of the last Americans to leave Japan were coming aboard. The shops were closed early by police order, and book sellers were too distressed and nervous to try to find anything out of the ordinary on such short notice. In 1947 there wasn't even time to get permission to change or spend money.

Although there isn't the glamor in ordering one's Japanese bibliophilic treasures from American dealers that there is in finding them oneself in a Tōkyō book shop, the collector, by force of circumstances has of late years secured all of his accessions from the two chief American dealers in Far-Eastern books, namely Dawson's Book Shop of Los Angeles and the Charles E. Tuttle Company of Rutland, Vermont and Tōkyō. For greatly appreciated help in finding

desiderata we thank Mr. Glen Dawson, the proprietor, and Mr. Richard Zumwinkle, a former staff member, of Dawson's, also Mrs. Hide Inada and Mrs. D. Frawley of Tuttle's. They have all taken great pains to help round out the collection by finding certain books that are certainly elusive and others that actually must be very rare.

The collection does not contain much more than is included in the exhibition and listed herewith. It may be considered reasonably representative of the botanical literature of the Japanese natural-history period, containing something of each main category and many of the historically more important works. One like the senior author who does not know Japanese can have, of course, only a shockingly superficial knowledge of Japanese books, but can appreciate their charming illustrations. The old books are mostly in a confusing cursive mixture of kanji (Chinese Characters) and hiragana writing, which makes the pre-Meiji books and manuscripts difficult reading even for Japanese. The collector of the books has attempted to review much of what has been written on the topic of old Japanese botany and block books in European languages. The junior author is of course responsible for what has been translated from the Japanese. Miss Su-Ying Liu has helped with purely Chinese passages and has written out the titles in conventional Chinese characters. The preliminary cataloging by members of the two book firms already mentioned has been very helpful, especially that by Miss Inada of Tuttle's Tōkyō branch. In preparing the numerous illustrations Mrs. Alvina M. Woodford has helped greatly by her great skill and care in making photostats from often soiled originals. Mr. Károly Kutasi has made the photographs. Mrs. Josephine K. Hoffman, Mrs. Stella Theros, and Mrs. Garnet E. Wubbena have helped greatly in typing and copy-reading from "gruesome" manuscript. Access to the rich resources of the library of the Center for Japanese Studies has been greatly appreciated, and especially the never-failing helpfulness of its Librarian, Mr. Yōtarō Okuno.

EARLY COLLECTORS OF JAPANESE SCIENTIFIC BOOKS: THE COLLECTION AT THE UNIVERSITY OF LEIDEN: THE VISITS OF SIEBOLD TO JAPAN

The first to bring Japanese books and botanical illustrations to Europe is said to have been the physician Andreas Cleyer, who collected some from 1683 to 1686 which went to the Berlin Library. A larger selection was brought by Kaempfer, of which 49 wood-cut books and prints were acquired by Sloane after Kaempfer's death (1716) and are now at the British Museum, but some went to other libraries. The

great Swedish botanist Thunberg acquired some few Japanese books, and these are at Upsala. Allusions to them are found in his Voyages and they have been referred to elsewhere in this article.

Aside from the medical men who were also naturalists, one of the few officers of the Dutch East India Company in Japan who showed scholarly proclivities was Isaak Titsingh, director of the Deshima Island factory at Nagasaki for three periods between 1779 and his retirement to Europe in 1784. He is supposed to have been the first European who collected, or at any rate saved, some of the individually published single-sheet color prints of Japan. As we have seen, there were earlier European collectors of the illustrated books, but Titsingh also secured a good many. After he died at Paris, in 1812, a collection of his literary work was published in French and subsequently translated into English (89). The volume listed his Japanese collections of works of art, books, maps and prints. Among them were nine engravings printed in colors . . . . representing Japanese ladies in various dresses. These seem to have been the first single-sheet Japanese color-prints that came to notice in Europe.

Titsingh's Japanese books, were in part accompanied by free translations into Dutch, as he wrote them from the dictation of Japanese translators at Deshima. About these, he is quoted by Hildreth to have said: "I found, among the interpreters belonging to our factory, four individuals sufficiently well informed for my purpose; a fifth had devoted himself chiefly to medicine, in which he had made rapid progress, in consequence of the instruction given to him by Dr. Thunberg." Titsingh had extensive publication in mind after his return to Europe, but died with most of his designs unaccomplished. The spendthrift Eurasian son who inherited his books and manuscripts dispersed them widely, but some fell into the possession of appreciative owners. Murakawa (48) refers to a notice of Titsingh's collection by Rémusat (56) in which are mentioned colored drawings of plants and several botanical treatises with very good woodcuts. A manuscript history of Japan in 80 volumes and a Chinese-Japanese encyclopaedia are also mentioned. The latter was presented to the French royal library.

Titsingh had been the first director of Deshima to interest himself deeply in Japanese science and letters, or at least, to pass on any information by publication in Europe or by bringing important collections.

Following Titsingh were two officials who collected both ethnographica and books, and whose gatherings were united at the Hague as the "Cabinet of Curiosities" but later (1883) were incorporated with the National Ethnographic Museum at Leiden. They will be found listed in Serrurier's Catalogue (66) of the library of the University

of Leiden, for the affiliation of the Ethnographic Museum Library and also that of the Leiden Rijks Herbarium with the University Library enabled the holdings of all three units to be listed together. The books of the Ethnographic Museum were collected by J. Cock Blomhoff who returned from Desima, or Dezima, as the little island was called where the Dutch had their "factory" at Nagasaki (linguists now prefer the spelling Deshima) in 1824, and by J. F. Van Overmeer Fisscher who returned in 1831 and wrote a copiously illustrated book which included much about Japanese customs, crafts, etc. Each of these officials wrote a catalogue of his collections; both remain in manuscript in the Museum Library. The Japanese books, however, appear to have had the status of ethnographic specimens, rather than books, until listed by Serrurier, for they do not appear in Schmelz's catalogue (64).

The eminent orientalist Klaproth (39) acquainted much for his private library from many sources. One was indeed unique. In 1805 and 1806 he had been secretary to a Russian embassy to China, and resided at Irkutsk, in Siberia, where the Empress Catherine II had established a Japanese professorship. He found the post occupied by a Japanese who had embraced the Greek Orthodox faith. Klaproth studied Japanese with him, and procured books from him.

Next came von Siebold. He published extensively on almost every phase of natural history and Japanese culture in general, partly in collaboration with the botanist Zuccarini. He wrote an essay on the status of Botany in Japan at the time of his visit (73). Like Thunberg, he had many contracts and exerted greet influence. He collected about 525 Japanese books at the time of his first residence in Japan, 1823 to 1830, which became the property of the Dutch Government, were combined with other collections at the University of Leiden, and catalogued by Serrurier in 1896. During the Edo period of restricted foreign trade the export of books and inland maps, as we know from von Siebold* himself, was forbidden, so whatever books he and his predecessors brought out were technically smuggled, even if Japanese officials winked at the infraction of the law. The biographical sketch of von Siebold by his sons (78) tells of the serious trouble that he and his Japanese disciples got into at the end of his stay. It became known that he was copying a map of the northern regions of Japan with the connivance of the imperial librarian and astronomer Takashasi Sakusayemon. The Government, suspecting that the intention might be, to put the map to some use harmful to Japan, imprisoned all of von Siebold's known Japanese students and friends, searched his

* Siebold listed the articles that could not be legally exported as follows: gold and silver coins, weapons, idols and cult symbols, books and land maps, paintings of famous old masters, clothing, costumes or silk embroideries worn at the court of the Mikado; also horses and cattle.

house repeatedly, confiscated religious objects and other things which he might have intended to export illegally, and informed him that he would not be allowed to leave Japan. At the first alarm, however, he had begun to conceal the things that he was most anxious to retain. His official friend at Deshima, Tsujirō, first informed him of what was about to befall on 16 Dec. 1829, and himself took some of von Siebold's maps to the director of the Dutch factory on the Island of Deshima for safe keeping. Von Siebold spent the night finishing a copy of the important map of Ezo, and gave the original back to Tsujirō for return to Takahashi the next day. Everything that was essential to his description of Nippon, manuscripts, maps, and books, he packed in a large lead-lined chest which was hidden "as well as possible," and Director G. F. Maylan of the Dutch Factory was informed. This gentleman was also personally entrusted with the copy of the Ezo map, to be placed in the archives. All this was done in the name of science. It was illegal, but at that time the objectives of the anticipating smuggling must have been purely scientific, not political, although years later Siebold had contacts with Russia of a suspicious nature.

Affairs went from bad to worse, and finally, 22 February 1829, the storehouse on the Island of Deshima where some of von Siebold's collection was stored, was officially searched and many of his most prized articles confiscated. It was 22 Oct. before he was informed of the decree that he was to be permitted to leave, but was to be forever banished from Nippon. By the time his ship sailed for Batavia, 30 Dec., some of his less suspected friends and students had been released from prison and assembled at the fishing village of Kosedo, where the ship stopped for them to bid him goodbye. His best friend, Takahashi, however, was not there, and von Siebold never heard from him again or ever learned what had become of him. It was finally assumed that his end had been a sad one.

The fate that overtook some of von Siebold's loyal Japanese friends was feared to have been tragic indeed. So when we read in Serrurier's Leiden Catalogue the bibliographic entries for the old items about Ezo that the explorer and geographer Mogami Tokunai had sent him, we realize that these and the hundreds of other books, maps, and manuscripts came out of Japan to Holland only by much suffering and possibly at the cost of the lives of some of his friends. Five years after the treaty with the United States was signed, the ban on von Siebold's return to Japan was lifted, and he revisited that troubled country. It was presumably then that he got the second collection of books which his son sold to the British Museum.

Von Siebold had hoped to make his second visit to Japan under the auspices of the American Government, and made application to

accompany Perry's expedition. He was much disgruntled when his offer was refused. The official report stated: "As soon as it was publicly announced that the United States had resolved on sending an expedition to Japan, applications came from all quarters of the civilized world for permission to take part in the service. Literary and scientific men, European as well as native, and travellers by profession, eagerly sought to accompany the expedition; and extraordinary influences, in some instances, were brought to bear upon our government inducing it to second some of the applications thus made; but Commodore Perry resolutely persisted in an unqualified refusal to all such requests" (33, p. 78). The very brief American allusion to the incident was made in connection with Perry's ruling that "all journals and private notes kept by members of the expedition were to be considered as belonging to the government until permission should be given from the Navy Department to publish them." The object of these regulations was to withhold information from other powers, which, if communicated, might jeopard the success of our mission. It was known that other nations, particularly Russia, had ordered ships to Japan as soon as it was known that the United States had sent there a squadron. . . Such were the general causes which led the Commodore to the determination we have mentioned, without reference to persons. It is proper, however, to add, that with respect to one individual, who manifested extraordinary desire to be of the expedition, and who has published untruths concerning it since its return (Dr. von Siebold), Commodore Perry refused on personal grounds. From information received from abroad, he suspected him of being a Russian spy, and he knew that he had been banished from Japan, where, by a violation of law, he had forfeited his life." (33, p. 79).

Certain it was that after the American expedition departed for Japan, von Siebold made a trip to Russia, which was explained by his son (78) as follows: In the year 1853 Siebold was called to Russia in order to give, as the Minister of Foreign Affairs put it, information that no other European could furnish. ("A fin de receivoir de ma bouche des renseignements sur une question qu'aucun autre Europien était a même de donner") Siebold's hope, he said, was to draw Japan into friendly relations with Russia to the northward, to open Japan peacefully to foreign intercourse by the intervention of Russia, and thus to forestall any forceful measures that might be resorted to by America, England, or France. Siebold would have undertaken to continue preferential trading status for Holland, since, as he explained, the interests of the Russians and the Dutch were no wise in conflict. The Crimean War (1853-1854) and the death of Czar Nicholas (1855), however, as the Siebolds state, were reasons why Russia ceased to push her policy of expansion for years, and in the meantime America took

action in 1854 to bring about the opening of Japan. Although Siebold may have been naive in trusting to his own ability to temper Russian aggression and expansion in the interest of Japan and of peace, there is no evidence, in view of the turn of events, that his willingness to play Russia's game had any political effect.

The ban against Siebold's return to Japan was lifted and his second visit took place at a time of great political disturbance, when diplomatic representatives of several foreign nations were murdered, but he was again somewhat in favor and was able to take a hand in the course of events. He had assumed credit for the success of the Perry Expedition by asserting that it was he who softened the attitude of the Japanese toward foreigners and reconciled them to the inevitability of opening of treaty relations with foreign nations. Certainly in Japan scientist Siebold had a following, it seems, which supported his own conception of his diplomatic accomplishments, for his disciples inscribed a memorial monolith at Nagasaki of which a translation would be about as follows: That, in the Years of the Periods Kaei and Ansei, the Party which sought to expel the Europeans and again to close the Empire, did not resort to War, and that a fortunate and peaceful Intercourse with Europe was established, is solely and completely the Service of those Men who were the Teachers and Exemplars of European Science. Finally, the Fame of the Great Deed; the Introduction of Civilization into contemporary Japan, rested upon Siebold to whose Memory this Stone is dedicated. (The German equivalent will be found in the biographical sketch by his sons(78).

A FEW IMPORTANT WESTERN COLLECTIONS OF PRE-MEIJI JAPANESE BOOKS

Only those collections of pre-Meiji Japanese books in Europe and America that have printed catalogues can readily be referred to, but some others, such as those of the Library of Congress and the University of California, are extremely important.

BRITISH MUSEUM. According to Douglas (23, 24) the first Japanese books and manuscripts in the Library of the British Museum were obtained by the accession of the Sloane, Cottonian, Harleian and Banksian Libraries, but the first collection of considerable size was obtained by purchase from Herr von Siebold in July 1868. This must have been Alexander von Siebold, whose father, the famous Philipp Franz von Siebold, had died in 1866. Even though small, however, the Sloane collection contained Kaempfer's books, and it was probably

Kaempfer who was the first to refer to a Japanese work in European literature. In 1882 and 1894 the works on art which had been gathered by William Anderson were bought. Others came from a famous orientalist, Sir E. M. Satow, in 1884. Miscellaneous additions down to 1898 brought the total to upwards of 5,000 separate works, some in many volumes.

Douglas's Catalogue of this great collection is alphabetically arranged, but there is an incomplete classified summary. This "Select Subject Index" contains only those books which seemed "likely to prove of permanent importance."

STOCKHOLM. Forming part of the Royal Library of Sweden, the Japanese book collection of Nordenskiöld was roughly catalogued while being collected in Japan. Recataloging was entrusted to Leon de Rosny (58) whose useful work was nevertheless defective, since it did not give the names of authors or editors of most of the books, but only the titles.

The Nordenskiöld collection was acquired during the famous "Voyage of the Vega". The Vega had been successfully navigated along the northern coast of the Eurasian continent in 1878 and 1879, and had achieved the "Northeast Passage." Reaching Japan, the expedition met with great acclaim, and at Yokohama was given a general ovation.

Nordenskiöld (50) began purchasing books in Yokohama, but did not find many there because this port had not been long enough of sufficient importance to have become a book center. There was a general technical laboratory in Yokohama whose proprietor was the Dutch scientist, A. G. C. Geerts, author of perhaps the first scientific work to be written and published by a European in Japan (29). Geerts's assistant was Mr. Okushi, a young Japanese, familiar with French, and it was the latter who was engaged to gather the greater part of the books, at first by trips back and forth between Tōkyō and Yokohama. Later, when the Vega was about to leave Yokohama, Mr. Okushi was sent to Kyōto on a book-buying mission and took his purchases to Kōbe by railway to meet the ship.

Nordenskiöld selected by preference books that were printed before the ports were opened to foreigners. In all he secured 1036 works in five or six thousand volumes, of which he classified 68 works as "Natural Science." This must have been by liberal inclusiveness, for so many titles are found in the de Rosny Catalogue only by counting some placed in other categories. De Rosny's Catalogue lists the natural history and related items approximately as follows:

(1) Agriculture	25
(2) Art	2
(3) Botany	11
(4) Dictionaries	1
(5) Education (actually natural products)	3
(6) History of outlying regions	2
(7) Materia medica	12
(8) Mineralogy; Fossils	2
(9) Natural history	11
Total	69

One who views the Clements Library exhibition will detect a liberality as great as Nordenskiöld's in the classification as "Botany" of certain books which are not chiefly or even largely botanical in content. A few books in other fields of natural history are included.

CHICAGO. In the United States the collection of Japanese illustrated books in the Ryerson Collection of the Art Institute of Chicago is one of the most important. The books have been meticulously described and annotated by Mr. Toda Kenji (90), Artist in the Department of Zoology of the University of Chicago. Mr. Martin A. Ryerson, founder of the Library of the Institute, began the collection prior to 1913. Its first bulk accession came from a private library which was sold by a Japanese art dealer in Chicago. In 1923 most of the Fenollosa book collection was added, after having been owned by Francis Lathrop and then by Mr. Hamilton E. Field. Next, in 1926, Mr. Ryerson added the great collection made during several years in Japan by Louise Norton Brown, which formed the basis for her very important book which is so frequently quoted in this work.

Toda's catalogue contains descriptions of about 1050 carefully selected works. Enhanced in utility by Toda's fine catalogue, the Ryerson collection is the outstanding one in America for the field that it covers.

ANN ARBOR. The Center for Japanese Studies at the University of Michigan has built up one of the best Japanese libraries in America, second in range of subject matter and availability only to that of the Library of Congress. It is publishing a series of bibliographical contributions which at first took into consideration not only its own holdings but also, in part, those of the Claremont Colleges, Stanford University, Yale, University of California, Library of Congress, University of Chicago, Northwestern University, Harvard, the New York Public Library, Columbia, and the University of Washington. Beginning, however, with the fourth number it has discontinued indicating the libraries in which each item occurs, because the more

recently published or less rare materials are being acquired with such rapidity by various American institutions that it is impossible to keep up with the current influx.

In the United States other important collections aside from the two largest, at the Library of Congress and the University of California (still uncataloged) are at the University of Chicago and the Boston Museum of Fine Arts. The latter institution has one of the world's greatest collections of Japanese prints, many of which are of botanical interest, and also the highly specialized Bigelow bequest of 137 books on flower arrangement, which for half a century seem to have remained unavailable. It is understood that the great collection of Far Eastern books that was gathered by Laufer (42) for the Newberry Library of Chicago has passed to the University of Chicago. Among private collectors of Japanese illustrated scientific books, Dr. Frans Verdoorn, head of the Biohistorical Commission of UNESCO, has been active, and there must be many others in the United States and Europe.

JAPANESE BOOKS AND PRINTS AS DESCRIBED IN THE REPORT OF THE PERRY EXPEDITION

There is no evidence in the published reports on the Perry Expedition (33 and 53) that the collection of books and prints brought back to the United States was a large one. There were, of course, the two samples of color prints that were reproduced by color lithography, these being two landscape prints by Hiroshige and a curious representation of punishment by crucifixion, which doubtless attracted the attention of the Americans as possibly reminiscent of the period of suppression of Christianity in Japan at the beginning of the seventeenth century when missionaries and Japanese Christian converts were crucified. Then there is mention of a two-volume work (among the "several specimens" of books and pictures) entitled "The Points of a Horse ," illustrated by a large number of woodcuts. This work, reported by the Perry report to have been written by Prince Hayashi, the chief member of the imperial commission appointed to negotiate the treaty with the United States, was presented by its author to Commodore Perry. The favorable comment upon these book illustrations and prints appears not to be that of the editor of the report, but of Professor Duggan of the Free Academy of New York who was asked to give his professional opinion, which was reported as follows: "In examining into the character of art exhibited by the Japanese in the illustrated books and pictures brought home by the officers of the

expedition . . . the same surprising advancement of this remarkable people, as they have shown in so many other respects, is strikingly observable. . . We are reminded, in a degree truly surprising, of the monochromatic designs upon Etruscan vases. . . The character and form in these Japanese illustrations, although apparently much in advance of Chinese art, are still typical rather than naturalistic; yet they are marked by an observation of nature which removes them from anything like conventionalism or manner."

The report reproduces by black woodcuts, one of the pictures of horses, and says of them: "These illustrations are from woodcuts of bold outline, and apparently printed with a tint to distinguish each in the various groups of the animal, by sober greys, reds, and blacks. The style might be classed as that of the mediaeval, and the horses might pass for those sketched in the time of Albert Durer, though with a more rigid adherence to nature. . . There is great freedom of hand shown in the drawing. The animals are shown in various attitudes, curvetting, gambolling, and rolling upon the ground, positions requiring and exhibiting an ability in foreshortening which is found, with no small surprise, in Asiatic art."

The pictures of horses which so greatly impressed the Americans were not original with Prince Hayashi, whose gift of a work supposedly by himself to Commodore Perry has not been found, but appeared much earlier in a work of Kyokuzan (Sawamoto Gaitei) entitled Kayō Hisō, illustrated by Juyōgi, 2 vols. (in 1) of Chinese text and two volumes of Japanese text with illustrations, Edo (Suhara Mohei Bookstore; Sekine Shimbei, Printer), Kansei 1 (1789). This work, of which the title has been freely rendered "Kinds of Horses," although it means, literally "Brilliant Coat Aspects," was secured for the collection through the kindness of Mr. Glen Dawson. It contains the presumed originals of the black wood-block reproductions of Perry's Report, but variations in the ideographs (which the American engraver would have had to trace exactly) indicate that Prince Hayashi did not give Commodore Perry the old work of 1789, but doubtless a later composition of his own reproducing older illustrations.

Our author goes on to comment with enthusiasm upon "a species of frieze, if we may so call it, cut in wood and printed on paper in colors. It presents a row or line of the huge wrestlers. . . The chief point of interest in this illustration, considered in an artistic sense, is, that apart from its being a successful specimen of printing in colors — a process, by the way, quite modern among ourselves — there is a breadth and vigor of outline compared with which much of our own drawing appears feeble, and, above all things, undecided."

The report also comments on "an unpretending, illustrated child's book, purchased in Hakodadi [Hakodate] for a few Chinese copper 'cash'." One of the woodcuts represented "what appears to be some Tartar Hercules, or Japanese St. Patrick cleaning the land of reptiles and vermin. . . This is drawn with a freedom and humorous sense of the grotesque and ludicrous . . . rarely found in similar books prepared for the amusement of children with us. . . All these . . . illustrations . . . show a humorous conception and a style of treatment far in advance of the mechanical trash which sometimes composes the nursery books found in our shops. A people have made some progress worth studying who have a sense of the humorous, can picture the ludicrous,

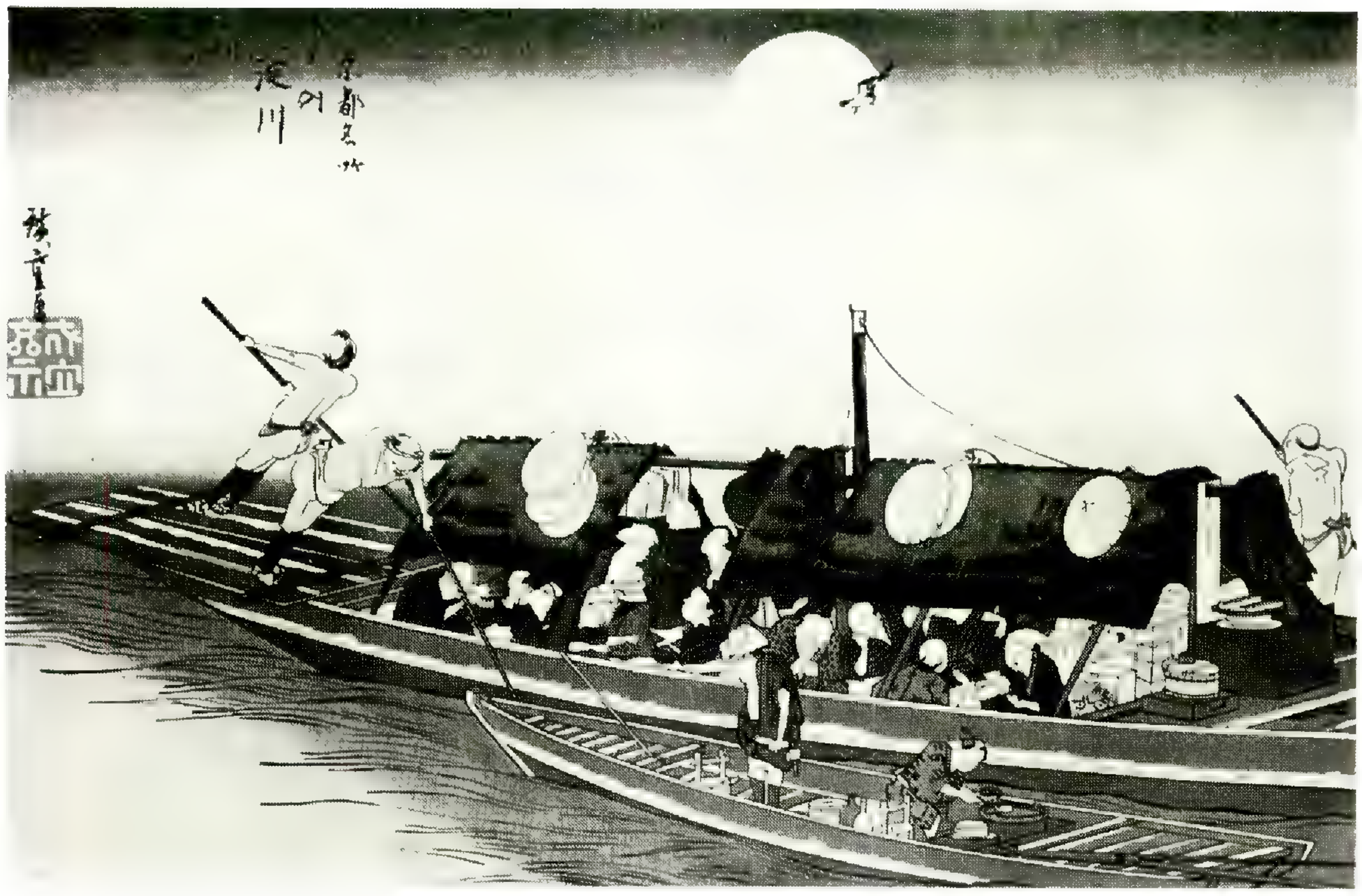
From Kayō Hisō (Brilliant coat aspects) which contains the presumed originals of the black wood-block reproductions of Perry's Report.

and good-naturedly laugh at a clever caricature."

It has often been remarked that American appreciation of Japanese popular art generally begins and sometimes ends with admiration of the landscapes of Hiroshige and Hokusai. It was quite in keeping with Hiroshige's later popularity that the two first Japanese prints that were seen in America, the ones reproduced in color by lithography in the official report of the Perry Expedition, should have been by Hiroshige. One was from the very rare series Kyōto Meisho (Famous Views in Kyōto) which according to Stewart (80) was an early work, consisting of ten large prints (recognized by the double line around each view) several of which are masterpieces. It was printed by Eisuidō. The print entitled "River Yodo of Kyōto" shows a company of people on a moonlight excursion being poled along the river in a large boat. Alongside is a smaller boat from which hot refreshments are being served. A bird is flying across the face of the full moon. The other print has been reconstructed by the lithographer from a triptych so that there is no discontinuity between the thirds, but the duplication of Hiroshige's signature on the outside thirds and the repetition thrice of non-marginal seals indicates the original form. The dark shading along the top margin, so characteristic of prints by Hiroshige, must have been eliminated by the lithographer, as well as the marginal seals of two of the thirds. The subject is "Crossing the River Ōi ," so difficult to ford that it gave rise to a proverb. The scene shows a multitude of fine lords and ladies being carried across in dignity on platforms, but one is perched with only a pretence of dignity on the shoulders of a single bearer. This print is more curious as a record of the times than artistic.

THE PERIODS IN THE HISTORY OF JAPANESE BOTANY

The history of botany in Japan has been roughly divided by Shirai (70 and 71) into three periods. These are: (1) The Pents'ao period, during which there was dependence upon books brought from China or Korea, and every effort was made to identify the plants of Japan with those of the mainland. The botanical works chiefly used were editions printed in Japan of the Chinese works on materia medica, and if illustrated, the wood-cuts were copies of those in the Chinese originals; (2) The Natural History period, during which Japanese plants were described and illustrated from wild or cultivated specimens, more or less from a utilitarian or artistic standpoint, but at any rate in a naturalistic manner, and, whether given a Chinese identification or not, constituting a beginning in the dependable recording of Japanese



A company of people on a moonlight excursion on River Yodo of Kyōto.

A multitude of lords and ladies crossing the River Oi.

botany, horticulture, and agriculture; (3) The modern or systematic period, during which plants of Japan have been classified by Linnaean or later European systems.

Needless to say, these periods overlap, just as they do in the somewhat parallel history of European botany. The first corresponds to the period in Europe down to the publication of Brunfels' famous and epoch-making herbal in 1532. Chinese and Korean manuscripts on plants and plant products had possibly initiated the study of Chinese medicine in Japan as early as 415 A.D. It became well established by 701 A.D., when a botanical garden of medicinal plants at Nara came under the control of a medical bureau, and Shirai tells us that this garden was in charge of two professors and six students of drugs. This was not long after the Tang Pents'ao in 20 volumes (669 A.D.) was compiled in China and taken to Japan by a Japanese student soon after. Subsequently various works were produced which depended upon Chinese originals. Shirai calls especial attention to three books written in 1156 by Henchiin Seikin which contain reproductions of the illustrations in a Chinese Pents'ao which he says is known in Japan as Tuku Honzō Dsukyō, and of which the original edition of 1060 is no longer extant in China. But the Pents'ao period can only be alluded to in this article, and so it must suffice to say that it corresponds culturally (and somewhat, also, chronologically) to the Middle Ages in Europe. Even if the conception of the "Middle Ages" is elastic and depends upon the special interests of the definer, to botanists it begins during the centuries when there was little botany aside from copies of Dioscorides and classical works, and ends when woodcut illustrations of plants in printed books ceased to be copies of often meaningless designs from old manuscripts. It ended rather abruptly for botany, with the publication of naturalistic woodcuts of actual plants by Brunfels, Fuchs, and Tragus.

As we shall see, the beginning of the natural history era in Japan was likewise connected with improvement in the art of illustration which came with the rise of the ukiyo-e school of popular woodcut art.

In Japan there would seem to have been a premonition of the second, or natural history period as early as 1274, when, Shirai tells us, Seia wrote a book, Bai-zu Kan, on diseases of the horse, illustrated by colored illustrations of seventeen medicinal plants so exactly depicted and so artistic as to be a treasure of the fine arts as well as of botany. Still the natural history period really began at a date after which there was continuous growth, and that depended upon the evolution of illustration. Shirai considers the approximate time at which Japan turned to the study of its own natural history as about 1601. A

new start was then made in the progress of Japanese civilization when peace was established by the Tokugawa Shōgun Ieyasu after a long period of war.

Of course there was a long overlap during which Japanese editions of old Chinese works continued to be avidly studied and regarded as authoritative, even though antiquated and at best only imperfectly adapted to Japan. More and more, however, European science came to be regarded as superior, and the little trickle that came in through the Dutch trading post at Nagasaki was quickly magnified into a great stream through wide dissemination by their disciples of the learning brought by a succession of such men as Kaempfer, Thunberg, von Siebold, Rein and Savatier.

The third period had some intimations of origin long before the natural history period ended, but for the sake of having a date, Shirai chose, for botany, 1868. Then Yatabe Ryōkichi, the first Japanese botanist who studied abroad, went to Cornell University. He returned to Japan in 1877, and became Professor of Botany at the Tōkyō Imperial University, which had grown out of the establishment in 1857 of a bureau for researches in western learning, namely, the Bansho Shirabe-jō. In this bureau there was a Natural History Investigation Section in which Itō Keisuke and Tanaka Yoshio were active. The year 1878 was remarkable for the publication of many works in Western style, or showing more marked Western influence than before, and might therefore seem a better date than 1868 for the close of Shirai's third period. It depends upon where one places the emphasis. Publications that are primarily in the field of art, but of strong interest to botany and horticulture as well, were continuously produced in an old mode until after the beginning of the present century. So the Clements Library exhibition has no fixed dates, but includes the sort of books in the old traditional style that were current when Commodore Perry visited Japan a century ago, together with a few to represent the transition to European style. The oldest available for exhibition dates from 1666. Admitting the arbitrary decisions that have to be made in attempting to delimit periods in cultural progress, one may consider convenient the periods Shirai chose for botany, namely: I. The Pents'ao or Chinese materia medica period, approximately A.D. 700 to 1601; II. the natural history period, 1601 to 1868; III. the modern period, in which Japanese botany has fused with the general current of world botany, 1868 to the present.

It is with the condition of Japanese science, art, and letters in 1854 and earlier that the Clements Library exhibition has to do, and because of the limitation of the collection they are little touched upon except insofar as they can be illustrated by the older types of botanical literature.

BEGINNINGS OF JAPANESE LITERATURE AND SCIENCE

Chinese influence, at first by way of Korea, had reached Japan as far back as there is dependable history. Since the first writing done in Japan was in the Chinese character, it is obvious that there must have been profound Chinese influence before there was any written Japanese literature. According to tradition it was a Korean scholar named Wani, invited to the Japanese court as imperial tutor, who became the ancestor of a hereditary class of official chroniclers known as the Chiefs of Writing (Fumi no Obito). It was Wani who introduced into Japan the Analects of Confucius and a curious poem, the Senjimon, unique among Chinese literary works in being written in exactly a thousand different characters of which no two are alike in form or meaning. This poem, according to Chinese chronology, was written by command of an emperor of the Liang dynasty by an author who flourished about 550 A. D. Lombard (45) mentions a record that there was difficulty about 575 in reading Chinese messages sent to the Japanese court from Korea. So the effective establishment of Chinese as a subsidiary language of the learned waited until Japan came directly into contact with China rather than through Korea.

In 608 A. D. an emissary was sent to China to bring back books and teachers, which he did a year later. By the year 654 as many as two-hundred and forty students were abroad. Most of the learned ones were or became Buddhist priests. Chinese influence was completely dominant in education. The first Japanese school that history records was established about 668; another, most nearly of university status for the time, dated from 681. Under Emperor Mommu (697-708) a code of law was compiled in twelve volumes, of which the eleventh volume concerned education. In the capital was to be a "university" to which the children of families of fifth rank or higher were to be admitted, together with the children of the Fumi no Obito, the hereditary chroniclers. There were also to be provincial schools of lesser status. All the schools were open to children of lower than fifth rank families by special consideration.

The "University," by the time the court moved to Kyōto (794), taught the reading and interpretation of the Chinese classics, history, law, mathematics, penmanship, Chinese composition, and Chinese phonetics. It was limited to 430 students and the provincial schools to a number from 20 to 50 each, so the maximum enrollment at one time for formal education could have been no more than 3000. Students were provided with food and books, so far as they had any books, for these are presumed to have come from China or to have been

made by the students who took down dictation from teachers to supplement the scarcity of books. The "University" and the provincial schools were supported by grants from the families whose children were benefited by them and by the interest on loans made to farmers by the government. In 794 one hundred thirty-two chō of rice land (the chō was a unit equal to about two and a half acres) were set aside to meet the needs of the "University."

As time went on a group of six schools were loosely attached to the "University" and supported by the great families for their own members, the first for peers at the west of the "University," others to the east and south, and one actually within the grounds of the "University." Those to the south became known as the southern departments. In addition to the family departments or schools there came into existence institutes of special knowledge, for medicine (including pharmacy, which led to the first teaching of botany), music, and divination (including astronomy and the compilation of the almanac).

Religion was excluded from the schools, so the Buddhist monasteries became secondary and eventually almost the only continuously maintained seats of learning during the dark centuries which were to follow.

Direct regular contact with China by the sending of students and embassies ended during the reign of Emperor Uda (889-897) and after flourishing through two centuries the educational system began to disintegrate. Break-down began about the year 1100, and governmental interest in education almost ceased when the "University" burned in 1177. Its function survived in part through the persistence of a school of the Ashikaga family, which held the shogunate. In 1439 a library was established for this school, which was especially famed for its books of the Sung dynasty. This school and library persisted as one of three great "universities" which Xavier mentioned as of good repute when he reached Japan in 1549.

In Musashi Province there was one other notable mediaeval library, the heart of a school, which was established by the Governor of Echigo about 1270. It had a large collection of books and writings, both Japanese and Chinese, and Lombard (45) informs us that some four hundred of its books were eventually to be preserved in the Cabinet Library in Tōkyō.

During the dark centuries of political confusion and almost continuous civil war, broken only by lighter intervals, education was chiefly fostered in the Buddhist temples and monasteries. Art flourished, for it was patronized in narrow circles about the court

and by the powerful families, but learning went more or less into hiding and thus merely survived, becoming more and more attenuated because of the lack of a sufficient educational system. The Buddhist priests sedulously preserved whatever books and writings they could gather together and fostered veneration for the written word, so that there was something to build upon when peace was finally restored and Japan entered upon the Edo period of prodigous indigenous cultural growth, which was built upon ancient Chinese tradition but constantly enriched by infiltration of European learning during and in spite of relative isolation from contact with other countries except Holland.

It must not be thought, however, that science and literature, but more especially art and technology, made no appreciable gains during the long period of general educational gloom. Art and artisanship had powerful patrons and there were intervals of peace during which there was enough intercourse with China to bring in additional books and to refresh teaching, and even war with Korea at the end of the pre- Edo period was eventually to bring booty in the way of books.

The significance, from the immediate standpoint of the history of Japanese botany, of the auspicious early beginning of Japanese letters and science and their more or less precarious foothold during a long period down into the seventeenth century lies in the fact that when the renaissance of learning began under the Shōgun Ieyasu the literature that was available for study, for dissemination by printing, and for scholarly interpretation was almost entirely Chinese. So the period of dominance of Chinese intellectual influence over European, and over indigenous and distinctively Japanese developments, ran over into the Edo period by more than half a century, and even after that there was a long period of overlap. So some of the books of the present exhibition (such as the encyclopaedias and the famine herbals) have a definitely Chinese stamp, or are translations from the Chinese. This would be even more apparent if books of the first two thirds of the seventeenth century were not entirely missing from the collection. They have become too scarce to be readily found.

THE PENTS'AO OR HONZŌ PERIOD OF CHINESE DOMINANCE OF JAPANESE BOTANY

The botany of Japan down to 1614 was almost entirely that of China and Korea and was associated with medicine. What was known of plants (and animals) except for the unwritten indigenous lore, was derived from old Chinese general encyclopaedias or from the more

restricted pents'ao or herbals, the latter dealing with plants in general, but mostly from the standpoint of medicine, and works on agriculture and horticulture. There was no essential difference, however, between the natural history section of an encyclopedia and a honzō or herbal. The latter title might apply to a quite general treatise on natural history or to a work that might be more appropriately classifiable as materia medica. A honzō might deal with plants only or include some animals and inorganic substances as well.

For convenience, because it coincided with a period in Japanese political history, Shirai, Japanese historian of Botany, designated the Edo period of shogunate rule, during most of which Japan was closed to foreign intercourse, except for the Dutch contact at Nagasaki, as the Natural History Period, as distinguished from the Herbal (Pents'ao or Honzō) Period before it. This was because there was a rapid growth of interest in natural history for its own sake during the later period, and relatively less special emphasis on materia medica. The earlier Herbal Period was dominated by rather slavish acceptance of borrowed learning directly from Chinese sources or from China through Korea. The natural history period extended from the accession of the Shōgun Ieyasu to the restoration of imperial rule in 1868, after which all science, including botany, was rapidly westernized.

PORTUGUESE INFLUENCE ON JAPANESE SCIENCE

The Jesuits entered Japan at the middle of the 16th century, near the end of the pre-Edo period and prior to the development of the general natural history outlook. They had already been established in China, and finding that Japanese literacy was based upon that of China, they built upon it by the introduction of Chinese books which were translations of European originals, as well as by direct teaching. Their scientific influence was chiefly in astronomy and the practice of medicine. Xavier himself taught geocentric astronomy and geography, and his teachings were considered a revelation. In China the Christian missionaries had been successful in having volumes on astronomy and the calendar published with imperial patronage, and these works, brought in by the Jesuits, established European scientific prestige which did not end with the expulsion of the Portuguese and Spaniards and the suppression of Christianity.

In medicine the missionaries also made a great impression. They established their medical art so successfully that it grew into a special school of theory and technique called "Surgery of the Southern Foreigners." (See Fujikawa, 28).

There is little remaining literary evidence of Portuguese influence on Japanese botany, but the Jesuits do seem to have accomplished something in the way of introducing foreign plants. There appears to be no record that they brought any European botanical books that reached Japanese hands, but they may have done so. They asked for land on Ibuki Mountain for starting a yakuen botanical garden for medicinal plants, which was granted them in 1569, and Uyeda says that certain alien plants in that area may have become established from their introductions. The Jesuits might have been expected to introduce useful plants into Japan from China or anywhere in the Orient as well as from Europe. According to Fujikawa (28) Father Louis Almeida was a dispenser of medicine to the poor. "In 1568. . . the Viceroy. . .allowed Portuguese missionaries to build a Christian Church in Kyōto. . .Of these Gregorio and Louis knew the medical art; they dispensed medicine among the poor and taught the art to students, thus using medicine as a means of missionary work." Shirai tells us that the Jesuits' garden of medicinal plants on Mt. Ibuki was to have been five chō square, about 62 acres, which, if ever planted, and intensively cultivated, would have produced a great supply of drugs for their medical-missionary enterprise.

THE INFLUENCE OF IEYASU AND HIDETADA IN THE BEGINNING OF THE NATURAL HISTORY PERIOD

The first Edo Shōgun, Ieyasu, inaugurated in 1601 a period of isolation, peace, and prosperity. Books were multiplied and learning grew apace. In 1607 a single copy of the great Chinese herbal Pen-ts'ao Kang Mu came into the hands of Ieyasu through the foreigners at Nagasaki. It was copied, commented upon, the names in it were tentatively synonymized with Japanese, and finally there was a first Japanese edition in 1637, and a second in 1652, with improved illustrations. These Japanese editions, entitled Honzō Kammu are scarce, and neither is available for our Clements Library exhibition. They inaugurated a period during which there was renewed study of Japanese natural history and natural products, and an intensive effort to correlate Chinese and Japanese names in general natural history as well as in materia medica. Several elaborate commentaries on the Honzō Kammu were written which showed indigenous achievement in the study of the Japanese flora. Synonymizing had gone so far as to show that Japan had plants for which no names were to be found in Chinese encyclopaedias or herbals. The Natural History period was inaugurated gradually and of course there was a long overlap during which unmodified Chinese works satisfied many, but original Japanese literature was more and more replacing mere translations or tran-

scriptions of older Chinese books.

Ieyasu stimulated activity of the medicinal-plant gardens and gathered information from experts in Kyōto and Nagasaki on drug plants, in which he was interested because of the wide-spread false-labelling of commercial drugs. His succcessor, Hidetada, continued his activity. Hidetada was a lover of ornamental flowers and plants in general. He established new botanical gardens (yakuen) of which the scope was broadened in order to study the characteristics by which the pure medicinal plants, yakusō, could be distinguished from the false. The value and effectiveness of many plants came to be studied at new yakuen in Edo and Kyōto, for stocking which 36 species of authentic yakusō were imported from Korea. As more gardens were established, the study of ornamental plants was pursued along with the medicinal, and so the study of materia medica was more and more transformed into that of natural history. The same naturalists were likely to write books in both the narrower and the broader field. In Chinese the greater compendia on materia medica dealt largely with general natural history, just as the greater herbals did in Europe, and the Chinese pents'ao became the Japanese honzō, both corresponding to the European herbal. In either China or Japan there was little if any difference between the natural history part of a classified encyclopaedia and an herbal. So in the Japanese literature of the 17th century there is no hard and fast distinction between an encyclopaedia, an herbal, and a natural history. Still distinctions are useful even if vague, and the inclination of the honzō was predominantly medical.

THE MEDICINAL-PLANT GARDENS AND THE INTERPRETATION OF THE HONZŌ

The growing of medicinal plants contributed much to the development of botany in old Japan. Before they were established the interpretation of the old Chinese herbals (honzō in Japanese) was a very hit or miss matter, for descriptions were vague and illustrations extremely crude. (If Linnaeus had known them and taken account of them in his Philosophia Botanica he would have consigned them to the rudissimae, with such companions as most of those which, in Europe, preceded the German fathers.) When, however, seeds were brought from Korea and China, so that entire plants could be studied and compared with what was native in Japan, a great improvement in the study of materia medica and of botany took place, which came about largely through the standardization of names. At the same time growing of medicinal plants was one of the chief means by which botany advanced, for it led to the establishment of botanical gardens, yakuen. We

are indebted to Shirai (70 , 71) and particularly to Ueda Sampei (91) for investigating the history of this subject.

The medicinal plant gardens were known as yakuen. At first only medical in their objectives, interest in ornamentals and curiosity about other plants led to their expansion into general botanical gardens, and one of those at Tōkyō evolved into the present Koishigawa Botanical Garden of the University of Tōkyō. The others, however, fell into neglect or ruin at about the beginning of the restoration of imperial rule in 1868. Enough vestiges and records still remained thirty years ago so that Ueda was able to obtain many historically interesting pictures and other data to indicate what the yakuen were like during their prime before the end of the period of the Tokugawa shogunate, from 1615 to 1868. Before then there were yakuen, but very little information is available about them, in the form of scattered and often vague references in old literature.

The earliest specific mention of yakuen is found in the Taihō-ryō, the code of law of 701 A. D., but before that time there is evidence that medicinal-plant gardens may have existed, unless medicine made from native Japanese herbs was made from material gathered in the wild. It is known that medicinal herbs had been imported before then from Korea.

Prior to A. D. 793 charity hospitals were established and the demand for medicinal plants (yakusō) was greatly increased. They were imported from China and brought in to the capital (Kyōto) from many provinces. Some provinces contributed as few as ten kinds, others as many as fifty. A prime objective was to identify Chinese medicinal plants described in the honzō with species that were found in Japan. As literature on medicine was brought in from China it became necessary to know what Chinese ideographs represented the native Japanese plants, and so a beginning was made in a written scientific Chinese nomenclature for plants, just as the learned men of all European countries, regardless of spoken language, struggled to know what classical Latin and Greek names might be applied to their native plants, and many were loath until late in the seventeenth century to admit that plants were to be found anywhere that had not been mentioned by old Greek and Latin authors. So in Japan the main botanical effort for centuries was to find Chinese names applicable to Japanese plants, and these Chinese names, whether correctly applied or not, became a scientific terminology for plants, especially medicinal ones.

Serrurier (66) who catalogued the great Japanese collection of Japanese books in the Library of the University of Leiden considered that this correlated nomenclature was one of the merits of Chinese

and Japanese science. At least the plants were named by two Chinese characters, the first to indicate the genus and the second the species. The criteria of classification (as in European botany at the same stage of progress) might be bad or superficial, resulting in unrelated plants appearing in the same genus, or vice versa. Consequently the older Japanese works might have seemed to Europeans of little utility if it had not been for the recognizable illustrations. The art of the illustrator rendered a true service to science. This was equally true, of course, of early European printed works of botany. As an example we may instance Brunfels, who made a great contribution through his excellent figures, although he did little in the way of characterizing species in words.

Knowledge of many yakusō is indicated in a still extant 50-volume work on medicine which was completed about 982 A. D., namely, the Ishinhō of Tamba Yasuyori. Knowledge of drug plants grew concurrently with increase in their cultivation and with development of the yakuen down to 1333, when a decline set in that was to last for years. The country was disrupted by war and lawlessness to such an extent that any scientific advance that took place was sporadic and discontinuous. There was an upturn during the period of Portuguese influence but that came to an abrupt end when Japan was closed to foreigners except for limited but potent contact with the Dutch at Nagasaki. The closing of Japan coincided with the beginning of a long period of peace with cultural restoration and growth.

EUROPEAN INFLUENCE AT NAGASAKI

There was constant European influence on development of Japanese natural history during the period (1641-1854) when the Dutch had a monopoly of trading at Nagasaki.

In the Dutch period however, three or four eminent naturalists or other men of learning visited Japan in the employ of the Dutch East India Company. Cleyer has been mentioned. The most distinguished of them, early visitors, Engelbert Kaempfer (1651-1716), left two works that rate as botanical landmarks, namely the Amoenitates Academicae and the History of Japan. These contained practically all that Europe was to learn of Japanese botany down to the time of Thunberg. Kaempfer was a man of the utmost intellectual curiosity and industry. His accomplishments put to shame most of the other servants of the Dutch East India Company at Deshima, who, since the time of the worthy Francois Caron, had made little progress in studies of Japan. A succession of the company physicians before Kaempfer

had, however, established the custom of giving medical instruction to Japanese. Caspar Schmabergen (1649) was the most influential in establishing the Dutch school of surgery.

Kaempfer was a German, son of the minister in the town of Lemgow. He was educated at the Universities of Cracow and Königsburg, and then went to Sweden. Here he became secretary of a Swedish embassy to Persia, and travelled through Russia to Ispahan, occupying his spare time in a diligent study of natural history. When the embassy was about to return home he was recommended by the Swedish ambassador for a post as chief surgeon to the Dutch East India Company's fleet, then in the Persian Gulf on the outward voyage to Batavia. Through that connection he was enabled to reach Java, and later reach Japan, where he remained two years, 1690-1692. In Java he had a chance to study tropical plants at the establishment of the Director-General of the Dutch East India Company in Batavia and in the garden of Heer Moller on Edam Island, a few hours distant from Batavia. This experience explains his references to plants of Java in the fifth fascicle of his Amoenitates, which is an excellent illustrated enumeration of many important Japanese plants under Chinese and Japanese names.

At the Dutch factory facing Nagasaki, on the little three-acre artificial island of Deshima, where he was practically a prisoner, the Japanese officers were solemnly bound not to talk to the Europeans except as trade required or to make any disclosures regarding domestic affairs of Japan, its religion, or its politics. Their stringent regulations were somewhat relaxed in such matters as the Dutch language, astronomy, natural history, and medicine, especially if orders came from high official circles to make specific enquiries of the Western Barbarians. So various officers and interpreters whom Kaempfer assisted with advice and medicines, information in astronomy, mathematics, etc., came to be very liberal in imparting information to him in turn. In particular a very discreet young Japanese was appointed to wait upon Kaempfer as his servant, and at the same time to be instructed in medicine and surgery. The chief Japanese officer of Deshima during serious illness was attended by him under Kaempfer's direction, with such a favorable outcome that the young man was permitted to attend Kaempfer on two journeys to the shōgun's court, and to be tutored by the foreign physician in the Dutch language until he had a competent knowledge of it. Kaempfer said there was not a book that he wished to see that this young man did not bring and explain, and that within a year no other interpreter had so good a knowledge of Dutch.

In May 1690, Kaempfer went as physician of the annual Dutch mis-

sion to the shōgun's court, when he made the observations recorded in his Amoenitates and in the later History of Japan.

When Kaempfer left Japan in 1692 he had made a great impression on Japanese natural history and medicine. He was permitted to take home with him a valuable collection of books and specimens. In addition to the four trips back and forth between Nagasaki to Edo he had been allowed the special privilege, as a physician seeking medicinal plants, to make local trips to botanize in the environs of Nagasaki, accompanied by the chief island officer and a numerous retinue of lesser ones, all of whom had to be feasted, which made a botanical trip too great an expense to be undertaken often, and likewise greatly interfered with collecting.

Kaempfer left Japan in November 1692 to return to Europe. He was too busy with teaching and medical practice to publish his Amoenitates until 1712, and his History of Japan remained unpublished until after his death, when his manuscripts and papers were acquired by Sir Hans Sloane, foremost patron of natural science, who was to become the founder of the British Museum.

Mention of what Kaempfer secured in the way of books will be found in the following chapter.

Physicians who came after Kaempfer and accompanied the annual embassies to the shōgun's court continued to instruct through interpreters and by demonstration, but the prohibition against reading or importing European books was still stringent. It appears that books that had been legally imported prior to the closing of Japan to foreign intercourse and were preserved in such a library as that the shōguns were still assiduously studied. Fujikawa (28) states that toward the end of the 17th century a Dutch version of Ambrose Paré's book on surgery was imported into Japan, and after the lapse of over a century was published in 1706 in an abridged Japanese translation. Its influence was great, for it started a new school of orthopedics as a subdivision of the science of surgery.

During the shogunate of Yoshimune the prohibition of all foreign books was relaxed, and in 1741 Noro Genjō was ordered to visit the Dutch captain who came to Edo every year to bring presents to the Shōgun, and to ask him questions about Jonston's animal book (1615) and the herbal (Kruid Boek) of Dodonaeus (1618) of which the former had been in the Shōgun's library since 1674. Captain Jacob van der Waijen was assisted in the interview by the assistant surgeon, Musculus, and the conversation was completely recorded and is still extant.

The same interrogation and discussion of the herbal of Dodonaeus continued every year until 1750, and all the dialogue was duly preserved and published. All this interest in Dodonaeus's great but by then antiquated two-century-old herbal crystallized in renewed study by Udagawa Yōan, who, according to Shirai (70, 71) published in 1816 a list of 670 species of Europe which he considered to have counterparts in Japan. The same author, in 1827, published Waran Yakukyō , on materia medica of the Dutch. Ōtsuki Gentaku wrote a treatise on natural objects, based upon Dutch works, in 1817. It seems (fide de Rosny) that the excellent Japanese botanist Itō Keisuke actually published in Dutch the following work, which has become very rare: "Naamlyst van Gewassen door den beroemden Natuuronder-zoeker C. P. Thunberg, M. D., op Japan gevonden, herzien en met Japansche en Chineesches Namen virrykt, door Itoo Keiske, te Nagoya. Boenzi XI (1828)." This work, a synonomy of Japanese and European plant names, appeared in a Japanese-titled edition in 1829, Taisie honzō meisō, 3 vols., with a woodcut portrait of Thunberg copied from the copper-plate in the Voyage. But in mentioning Thunberg we have jumped ahead of the proper sequence of events.

Carolus Peter Thunberg, Swedish botanist and student of the great Linnaeus, visited Japan in 1775-76 as a physician of the Dutch East India Company in order to study the plants and to make the collections upon which the first organized and usable flora of Japan was based. He made Japanese friends to whom he was devoted, and came to exercise a great personal influence in Japan. Although 95 years had intervened between the departure of Kaempfer and his arrival, he found little change in the restrictions imposed upon the Dutch or their non-Dutch European employees at Deshima. Through the liberal views of Yoshimune (Shōgun from 1677 to 1751) the Japanese had become more anxious to secure foreign books of science, and letting them enter the country was not so strictly regulated, but otherwise conditions were about as before.

Thunberg had much trouble in getting permission to botanize in Japan. A delay of three months was occasioned because someone who had previously been permitted to do so had been entitled "surgeon's mate," whereas Thunberg was "surgeon." Why persons of different status should do the same thing either perplexed the Japanese officials, or they pretended that it did. Finally the permit was granted but each excursion cost him sixteen or eighteen taels because of the feasting of the twenty to thirty Japanese officials who attended him. With this great retinue he was permitted to roam over the hills near Nagasaki. Later, on a visit to Edo, he passed through the mountainous tract of Hakone which separated the bays of

Tōtōmi-nada and Edo. Here there were numerous shrubs and trees. Thunberg frequently deserted the norimono (palanquin) in which he was carried by bearers, ran ahead and scrambled up the slopes, to the great distress of the inferior officers who were assigned to keep constantly with him. Having previously been used to running up rocks in the African mountains, he said, he frequently got far ahead of his anxious and panting followers and was able to gather many of the curious and scarcest plants, which had just begun to flower.

During 26 days at Edo, Thunberg was not allowed to go out of quarters, but was ceaselessly interrogated about astronomy, in which he couldn't help, and matters of natural history and medicine. Of plants and materia medica the Japanese had considerable knowledge, which he supposed to have been collected from Chinese and Dutch books, and partly from the instruction of Dutch physicians, some of whom, however, Thunberg opined, were little better than "horse-doctors." Two Japanese who became his friends came to see Thunberg every day and questioned him unceasingly. They often stayed until late at night. At Thunberg's leave-taking from his two medical friends, to whom he was warmly attached, he gave each a certificate in Dutch of their proficiency, which they treasured as highly as young European physicians would their diplomas. Both corresponded with them after his return to Europe. One of them is said to have been the emperor's personal physician, the other (older and better informed) was physician to one of the chief princes. They sometimes wearied Thunberg at first, and one suspects that he wished the questioning might be less one-sided! but they were friendly and acutely intelligent, so he had much pleasure in their company. They had a number of Dutch works on botany, medicine and surgery, and Thunberg sold them some of his. They brought him botanical specimens, ores, minerals, fishes, and insects.

In the account of his travels, Thunberg (86) had little to say about printing and books in general. He seemed to have seen no type-set books, for he said that all were printed from engraved wood blocks. Regarding those that he procured or saw he said that one of his disciples, the studious Sunnan, had given him a work on botany in eight volumes, printed in Japanese, containing the description of some plants, with detestable figures; each volume having a thickness of a line or two at most. He encountered other more or less voluminous works of botany, embellished with crudely executed figures, such as the "Sooqua-Iensō" Sōka-ensō,(herbs and garden flowers), an herbal divided into three parts, treating only of the indigenous plants of Japan; the "Morokonsi-Koomoosi" (Morokoshi Kimmō-zui, see Exhibit No. 2), a kind of a general natural history in several parts, which contains the description of

different plants, animals, mammals as well as birds and fish, with treatises on arts and crafts and of rural and domestic economy, provided with figures. This, it was said, originated in China. Another existed called "Kimoonsi" (Kimmōzui, see Exhibit No. 1) printed in Japan in thirteen volumes "in quarto," more beautiful and better than the preceding.

From the insufficient descriptions and titles which Thunberg gave we are unable to identify some works which he referred to as herbals, but he did not think too highly of the figures. He did refer to one as "a pretty herbal" under a title suggesting somewhat the title of one illustrated by Tachibana Yasukuni (1756) but he described it as in eight instead of five volumes.
An early enough 8-volume edition is not known to us, but one is reported as having been published later than Thunberg's time.

He was offered a chance to acquire a work on ichthyology, in two parts, "in quarto," with well engraved pictures of the fishes of Japan. It enlightened him greatly and he remarked that the figures showed exactitude and intelligence "that would do credit to our European artists" (Vol. III, p. 386).

He remarked that export of Japanese printed books and maps was forbidden. (86, Vol. III, p. 19, 300). Still, he was not prevented from getting some and taking them away.

Thunberg had a low opinion of the Japanese wood-cut illustrations, which in his eyes were crude, but some, he admitted, had the merit of being faithful to nature. He commended the artists for drawing actual plants and animals rather than drawing upon their imaginations.

Other scientific visitors to Japan followed Thunberg. The important work of Siebold has been referred to in the section on the Japanese books of the University of Leiden. Rein was a German scientist who visited Japan at about the same time as Siebold, and wrote various books and articles that called the attention of Europe and America to the status of science, art and technology in Japan (54 , 55). They were beautifully produced.

In the period closely following the Perry Expedition the most important European botanist in Japan was Savatier. His collections formed the basis of Franchet and Savatier's Flora Japonica (27). He tells how he tried to get one of the chief current Japanese works but failed for two years because in asking for it he used the pronunciation Kwa-i for the title, as was current in Yokosuka, whereas in Edo (then Yedo, now Tōkyō) it was Ka-i. This work of Ono Ranzan

and Shimada Jubō is shown in two editions (Exhibit No. 22, 1st and 2nd eds). In addition, he made use of two other indigenous botanical works, the Sōmoku Zusetsu of Iinuma Yokusai (Exhibit No. 29) and the Honzō Zufu of Iwasaki Tsunemasa (Exhibit No. 23) to which he referred in the translation which he and Saba made of the Ka-i.

EARLY HISTORY OF JAPANESE WOODCUT ILLUSTRATION

The first wood-cuts printed in Japan were on single sheets, and represented Buddhist divinities. They had their prototypes in China, in the Buddhist prints called "tun huang" of which one, of 607 A. D. is the earliest known dated print of any kind that is known to exist. Others of the years 659 and 670 were in the Yamanaka collection which was exhibited by the College Art Association about 1932 at various institutions, including the University of Michigan. (Yamanaka, 95). These ancient Chinese prints are not only the oldest dated printing extant but also the first printed representations of a plant, even though it is depicted as a religious symbol, for Buddha is shown standing on a lotus pedestal or seated on a lotus throne in those of 659, and is standing under a lotus-leaf canopy on a lotus pedestal in that of 670. The lotus was sacred to Buddhism.

The corresponding Japanese prints were printed at temples and served as souvenirs for worshippers and especially for pilgrims from afar. They date back to the eighth century, and have been found among the ancient records and treasures of several temples. Some have been found inside of hollow Buddhist statues. Their purpose was indicated by an inscription of date corresponding to A. D. 1333 attached to the main statue of Kwannon in a temple near Kyōto which read: "Printed every day 333 figures of Kwannon to divide among believers" (Brown 12, p. 9).

These old Japanese Buddhist pictures were known as omi-e. They were portraits of the sacred images in the temples, and themselves esteemed as holy, since they were printed and distributed to worshippers in order to propagate the faith and thus secure the future happiness of ancestors of the donors to the temples. The founder of the modern interest in collecting them, Yamanaka Sadajirō (95) secured and exhibited in America numerous interesting examples, dating from 1407 to 1830, as well as four of the Chinese prototypes mentioned above. It was quite natural that such religious pictures came to be used as illustrations for books of prayers or sacred Buddhist books. Brown (12) cites a book of the period A. D. 1166-1169 with a single-block frontispiece on which are shown the nine Buddhist images of the temple where the book was published.

A book of prayers dating from the year 1287, with several illustrations printed in the text, came to light in 1914 during the rebuilding of an old temple library. Books printed in Japan without illustrations preceded those of Europe by about four hundred years. The first unillustrated Japanese book may have been printed in 1080 A. D.

The next stage of Japanese book illustration was marked by the passage from mere picturing of divinities to a series of story-telling pictures. The first of these is in a book of 1412, in which the illustrations depict the passage of the soul along a path from earthly life to the Buddhist paradise. This included perhaps the first Japanese printed illustration of plants, which may have been engraved about 1441, although the book can be dated only by close similarity of binding, printing and paper to one which is definitely dated. It is entitled Jūgyū-zu (Ten Pictures of the Ox). In Zen Buddhism the ox is a symbol of truth, and ten stages in the search for and comprehension of truth are represented by pictures of a man hurrying along a path, carrying a rope; of his finding evidence that the ox is somewhere ahead of him; of his catching sight of the creature itself, disappearing into a thicket; of his roping the ox and being helplessly dragged by it; of his subduing and leading it; of his riding on its back, peacefully playing his flute; of his meditation in the mountains; of his attainment of spiritual calm; of his absorption in the appreciation of beauty; and, finally, of his meeting with Buddha. It is the picture representing appreciation of beauty which introduces the flowers, and, as they had to be placed within a circle three inches in diameter, they are presumably more symbolic than naturalistic.

Flower painting, however, had long since been highly developed in Chinese and Japanese art, both in decorative design, and as naturalistic representation, so the beginning of flower engraving for book illustration in Japan could lead in either direction, or in both directions at once, for to a people as appreciative of natural beauty as the Japanese it was entirely consistent to strive simultaneously for beauty and accurate representation.

Obviously there should be no further repetition of the disproved statement that the first Japanese book with printed illustrations was the Ise Monogatari, a book of hero tales published in 1608. This book, however, is nevertheless an exceedingly notable one in the history of Japanese printing, for it seems to have been the first dated Japanese illustrated book that was printed from movable type. Furthermore, the subject matter was indigenous, not Chinese in origin. The collector of old Japonica will find volumes printed from type to be rare, whereas those printed from blocks on which the text was engraved in cursive Chinese characters supplemented by

hiragana, together with the pictures, are common. After 1856 Japanese books were more often printed from type in Chinese ideographs (which they call kanji) generally with hiragana or katakana (truly Japanese syllabic characters) to indicate Japanese grammatical construction. The Japanese have taken pride in maintaining the clumsy ideographic writing which is neither necessary nor even well adapted to their non-tonal language. It was useful, of course, in the early days when imported Chinese books were the only printed ones in Japan, and even later, when the multiplicity of Japanese local dialects would have made phonetic writing difficult of general comprehension. Now that literary Japanese has become standardized, however, it would be a great gain to the Japanese to use phonetic spelling, which has in fact made some headway but seems to be opposed mainly because it would make obsolete, except to antiquaries, such a great body of literature. This is indeed an important consideration. Certainly the Japanese dialect societies would now welcome purely phonetic rendering of local folk-lore, names of plants and other natural objects, etc.

Most of the illustrated books shown in the Clements Library exhibition were not printed from movable type, but from solid engraved wood-blocks, although they are from one to three centuries later than the Ise Monogatari. The latter coincides fairly closely with the beginning of non-religious book illustration, which probably did not long precede an illustrated book on swords that appeared in 1596.

The scientific book illustrations of Japan were at first mainly copies of those in Chinese books, many of which were excessively crude. The earliest were printed in black, even though some of them were apparently intended to be colored individually by hand, and often were, just as European wood-cuts were in the same period. These were the precursors of pictures that were later actually printed in color.

Needless to say, black illustration continued and flourished side by side with color throughout the history of the wood-cutting craft. Some of the same artists who were successful in painting for reproduction in color also made beautiful drawings for black pictures. The illustrators in black were favorably influenced by the development of the popular or ukiyo-e school of artists, who did their work for reproduction, but insofar as they copied (as they had to do in preparing Japanese editions of Chinese botanical works) from very crude Chinese woodcuts of plants which had not yet been identified with species of the Japanese flora, they had no way of

improving upon the pictures in the imported books.

It therefore came about that indigenous works of romance and legend were being printed in Japan with artistic illustrations while Chinese books of natural history still continued to appear in Japanese editions with utterly inadequate copied woodcuts. This condition could only be slowly remedied (so long as the Chinese literature was all there was) as the naturalists identified the plants and animals of Japan with those of China and furnished the artists with actual specimens for illustration. This was a long-drawn-out process of which the results began to be manifest after the middle of the seventeenth century. Japanese scholars had an aversion to writing about anything exclusively in their own excellent katakana syllabic writing. Until they knew what Chinese characters to use for a plant, the latter had no literary recognition, regardless of how well known it might be in unwritten folk-lore. So the beginning of the true "Natural History Period" in Japanese science had a long overlap with the preceding "Honzō" period that was dominated by the ancient learning embodied in Chinese herbals and encyclopaedic works, for the latter were distinguished from the former only by greater inclusiveness.

A reaction of popular art upon scientific illustration must be supposed to have come from the depicting of plants for surimono (single sheet wood engravings) to be used as New Year's greetings. Strange (82 , p. 148) translates from an old Japanese work as follows: "In the period Genwa (1616-1623) Katsushika Hokyushi, a comic poet who lived in Musashi, ordered Chikamatsu Ryusai to engrave on cherry-wood a picture of a pine branch, and this was the beginning of surimono." This would presumably have been printed in black, and, if colored at all, the basic print would have been painted by hand, for this was the way in which most of the early colored pictures were produced. As soon as realistic and beautiful pictures of plants became common, and the same artists who made them were employed as book illustrators, there was bound to be a reaction against crude and inaccurate pictures in the style of the old Chinese herbals.

THE TRANSITION FROM BLACK TO TINTED; AND THEN TO FULLY COLORED ILLUSTRATIONS

The first Japanese color prints were called beni-e, from the pink pigment beni for which a second wood block was cut in addition to the basic one. The earliest Japanese color print of a flower was discovered by Brown (12 , p. 29) in a book of about 1627. It pictures a camellia printed from two blocks in pink (beni)

and grayish green. This was obviously an experiment for it was the only color print in the book, and preceded the general use of color printing by ukiyo-e artists by almost a hundred and twenty years. Later editions of the same book had a plain black print in place of the tinted one. In the long meantime, however, there were hundreds of illustrated books printed and one precisely dated scientific book of 1644 was the earliest with an indisputable date and bicolored illustrations. A copy has very recently been offered for sale in the United States by the Charles E. Tuttle Co. A reproduction of an earlier Chinese original, it is entitled "Enlightening Discourses" (Semmei Reki) and deals with phases of the moon, latitude and longitude, Chinese time measurement by water clocks, etc. The illustrations are prints of the kind that the Japanese call tane-e from the red-lead pigment (tane) which was used to intensify the illustrations. Except for subjects properly illustrated in red, neither pink beni-e nor deeper red tane-e were any more naturalistic than black prints. Color may have been used in illustrating many other early books which probably no longer exist in even a single copy, for there was a long time (before antiquarian book-collecting was in vogue) when old books that seemed to have been supplanted by newer ones were considered of no value, and were not kept. Students of cultural and scientific history would now compete for their possession.

The next stages in the development of color printing were of course the use of more colors and the representation of objects in at least approximately natural colors.

Ōoka Shunboku was a famous artist and illustrator of books, both in black and in color. Brown (12) states that his work "embraces some of the most striking black-and-white sketches which, perhaps, have ever been done for wood-engraving." He imitated in his color wood-cuts the Kano style of painting in flat masses of color, and Chinese painters of the Ming dynasty, and was one of the earliest Japanese artists to illustrate by color prints. Unfortunately, his two volumes of natural history prints are excessively rare. They are entitled Minchō Seido Gayen, and contain thirty-six double-page flower and insect prints in from five to seven colors. The date, 1746, was only three years later than the same artist's use of two-block illustration. Up to 1920 only one copy of the first edition of this work was known, at least in Europe, and that one was in the British Museum. Until Arthur Morrison described it, Japanese wood-block printing in natural colors was supposed to have dated from the decade 1760-1770.

Masanobu produced 2-color prints, beni-e, beginning about 1742. He was a publisher as well as an artist, and was in a position to lead in the popularizing of color printing. Color printing of the sort he did never entirely ceased during the entire woodcut period of illustrating, down to the present century.

Hand-coloring of black prints, of course, played its part in popularizing prints and in leading up to printing in full color. Moronobu (ca. 1625 ca. 1695) had a tremendous impact upon book illustration. He dealt a death blow to the copying of crude Chinese woodcuts. Beginning about 1660 he illustrated a hundred or more books and volumes, including many of the first ones that were distinguished for artistic value. Ficke (26) said: "These books and prints, widely circulated, carried to the eyes of the masses a new and delightful diversion, spreading far and near the contagious fascination of this lively ukiyo-e manner of drawing . . . ." Although issued with black illustrations, many were colored by hand, and Brown (12) states that Hishikawa Moronaga, Moronobu's son-in-law, was especially noted for the beautiful coloring which he applied to his own illustrations and those of his father-in-law. Hand coloring continued for a century or more.

These hand-colored illustrations, and the unnaturalistic but effective black and red (beni-e and tane-e) prepared the way for full-color printing. Regardless, however, of the previous long history of black wood-cut pictures, of the experimental beginnings of bicolor prints, and the earlier Chinese origin of color printing, book illustrating became distinctively and essentially Japanese in spirit after it was taken in hand by Moronobu, who has been called the second founder of ukiyo-e art. He consciously modified his style to suit the possibilities of reproduction by woodcut. It was he who created a new style of book in which pictures largely eliminated the need for text. In black unless colored by hand, these were the early ehon, or picture books. He also produced the first of the single-sheet prints, the ichimai-e, characteristic expression of the school, and these were sometimes hand-colored.

Until 1765 most actual color prints, as distinguished from hand-colored prints were the beni-e and tane-e, in black (varied to gray) and pink, or vermilion, and sometimes with blue or green. Such actually persisted in book illustration for many years after printing in full color was common. Moronobu's black prints were sumi-e, i.e., in black only except as tones of gray were achieved by dilution of ink or partial wiping of the inked wood-block. There had previously been cheap popular paintings in color called otsu-e and for centuries some of the old temple prints of Buddhist divinities had been

hand-colored. The same was true for the early books of the 17th century which had been printed on especially heavy paper of excellent quality. By using the black print as a base, the same pigments used for otsu-e could easily be flatly applied so as to imitate somewhat the effect of paintings of the Kano school. Black and hand-colored prints began to be replaced by color prints about 1765. According to Binyon, "Bakin the novelist, in his Enseki Zatsushi wrote that brocade-prints, nishiki-e, first appeared about the second year of Meiwa (1765) and rivalled (or 'copied') the Chinese color prints."

Brown (12 , p. 111) expresses the belief that color printing in Japan arose as a result of Chinese refugees bringing color prints from China to Japan early in the seventeenth century.* She had heard of, from Japanese book collectors, but had not seen, a 1744 edition of a Chinese book, of which the Japanese title was Kaishiyen Gafu , with color prints of orchids, bamboos and landscapes. She notes that the color woodcuts of Shunboku's first book in full color (Minchō Seido Gayen, 1746) were in pure Ming style.

A six-volume Chinese work on drawing was republished in Japan in 1748 as Saiseiyen Gaden, and that is said to have contained color woodcuts. In the same year, Brown reported, (12 , p. 112) a Chinese book of 1701 (Ling Mao Hua Hui) was reproduced in Japan by Yamamoto Kihei.

Kusumoto Sō Shiseki (ca. 1711-1786) illustrated books with the mainly black pictures varied toward gray and accented with touches of color. His works included Sō Shiseki Gafu (Sketches of landscapes, flowers, birds, etc.) 1765, (Exhibit No. 92) and Genji

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*CHINESE ORIGIN OF THE PRINTING OF WOODCUTS IN FULL COLOR

The earliest illustrating of plants and animals by color printing lay back in China, where, however it never had great vogue. In fact, good Chinese color prints, either in books or as single sheets, are exceedingly rare. So, in the British Museum, according to Binyon (8) the best examples are old ones which have been in the collection since they were received with the other possession of Sir Hans Sloane, presumably brought by Kaempfer from Japan (1692-3). Binyon described them as "printed in gay colours on very thin brittle, white paper made from rice pulp. Twelve colours were produced by single printings, and ten more by superimposed printing of one tint over another." Some of them were: flower arrangement, with box of paintings; pomegranate & other flowers in a tall vase; crimson hibiscus and purplish-brown orchid actually peony, reproduced by Binyon and showing a true flower arrangement resembling some of the Japanese; begonia & chrysanthemum; crimson peony, spray of magnolia, etc.; crimson hibiscus, russet-hued chrysanthemums, and white hibiscus flushed with yellow.

Ike-bana-no-ki (Flower Arrangement), 1765. These are both scarce, but a copy of the latter has recently been offered by the Charles E. Tuttle Company of Rutland, Vermont. The former is the earliest color-print book that we are able to show.

From the remarks about the Sō Shiseki Gafu by the artist's disciple Fuku Mogi we learn that the pictures were in large part based upon earlier ones by the Chinese artist Chin Nampin, a Ching dynasty artist who worked and taught in Nagasaki about 1731-1733 and greatly influenced the course of Japanese art. The work of some of Kusumoto's pupils at Nagasaki is also represented, and we must suppose, some of his own that were not copies but original with him. His brush-name, Sō Shiseki, was made up from the name of his own master at Nagasaki, who had succeeded Chin Nampin as leader of the Chinese school of painting there.

The various artists whose work is represented in the Sō Shiseki Gafu did not work in the same style, so there is great variation in the technique of reproduction. The most effective are those in one color with modulation of tone affected by partial wiping of the block. Brown, however, has a different interpretation, saying: "Even when color was not introduced, the printing was peculiar and interesting, emphasis of tone being obtained by holding a part of the paper much more closely to the inked block than the rest, thus gaining a sharpness and definiteness where these qualities were desired, and a more or less misty affect where distance was expressed or too great clearness not wished."

Unfortunately these early prints are not dated. They indicate that however, refugee Chinese artists from China, or the normal course of trade, may have brought models to Japan for the early experiments in color printing. Binyon also listed seven Chinese prints of birds and flowers (therefore corresponding in China to the derived kachō tradition in Japan) which he describes as less elaborate in printing and coloring than those just described, and considered probably to have been made during the reign of Kang Hsi, which began in 1662. These prints were probably less than 30 years old when Kaempfer got them. Isolated experimentation in Japan as early as 1627 merely substantiates the probability that contact with China led to the later Japanese developments.

Binyon says that the first Chinese color prints did not appear before the close of the Ming period (1368-1644) "when they begin to appear in books on the practice of drawing and painting." Langdon Warner, he said, considered that 1625 A.D. "is the earliest date we know for an actually existing colour-print." Binyon concluded that "when the Japanese took up . . . printing in colours, there was really nothing left for them to discover that had not already been practised in China . . . ."

Some of the plants are printed in pale, flat masses of color without any outline, in the style later used by Masayoshi. There are landscapes with the pale color applied in masses without any detailed conformity with the outline block, in the impressionistic bunjinga impressionistic style, and black, unshaded line drawings such as those done regularly for botanical illustration. The three volumes are indeed remarkable for diversity of style and clear evidence of experimentation. The volumes are of the ordinary shape because printed for very wide margins, where sewed together. The page figures and half-diptychs are, however, of an unusually tall and narrow shape. The diptychs which we reproduce are brought together enough to unify the designs.

Brown says: "Sō Shiseki's books are not well known in Europe and America, and even in Japan complete sets in good condition are very difficult to obtain especially those printed on the Chinese paper, Japanese collectors prizing them too highly to leave many to the Europeans who have fallen under the spell of the old ehon."

Utamaro (92) produced early color-print books in which insects, birds, and shells were exquisitely illustrated. Thereafter a constant succession of fully colored wood-block prints of plants appeared in books that were mostly of interest as art (such as the kachō and related productions) whereas the scientific books and those in which text was important as well as the pictures continued to be illustrated mostly in black. This was true so long as the woodcut was an essential feature of Japanese books, which was far into the Meiji period, after 1868.

Binyon wrote: 'During the Meiji period a certain number of prints were made after designs which had never been engraved in the artists' lifetime. There is, for example, a set of large 'Flowers and Birds', after Hokusai, signed Zen [former] Hokusai Iitsu, which are sometimes mistaken for work published by the master himself . . . . . Another (oblong) set of 'Flowers and Birds', with the same signature, was vamped up from Taito's book 'Kachō Gaden', published in Ōsaka, 1848-9."

The entire period of color printing falls within the Natural History Period of Japanese scientific history. Likewise all of the naturalistic illustrating from actual Japanese plants or animals falls within the same period. So far as our exhibition is concerned, the only books illustrated with copies of older Chinese woodcuts are in the nature of hold-overs from the Herbal Period. Other coincidences of the Natural History period of science are with the Edo or Tokugawa Period of internal political affairs, and with the period of Dutch

monopoly of intercourse with Europe.

EARLY EXPERIMENTS IN EUROPEAN METHODS OF ILLUSTRATION: COPPER-PLATE ENGRAVING AND LITHOGRAPHY

During the period of Dutch trade with the Japanese at Nagasaki many European books reached Japan, regardless of laws prohibiting their entry, and the Japanese showed great curiosity about the technique of copper-plate engraving. Their experiments with it in map-making have been recorded in a list by Beans (6). The replacement of the older wood-cuts was never extensive, however, down to the time when these newer methods were themselves being replaced by line and half-tone illustration by photographic processes and by collotypes. So we find only a few liberally illustrated books in which there are only copper-plate engravings or lithographs, but a considerable number containing one or a few such European-style pictures.

Copper-plate engraving is said by Ryū Susumu (60) to have been first practiced in 1783, for landscape pictures and maps. One of the pioneers in the use of the process was Shiba Kōhan (1746-1816) who produced one of the great books of travel within Japan (see Exhibit No. 56). He learned recess engraving and other Western methods by contact with the Dutch at Nagasaki, and several of the books which he illustrated contained copper-engraved maps. One had eight copper engravings. Brown (12 , p. 147) says that two of his books which are highly prized for their historical value as souvenirs of Dutch influence and command high prices in Japan are devoid of the slightest beauty, one of them containing his pictures of flowers. His true name was Andō Kichijirō. He was a pupil and possibly an adopted son of the great artist, Harunobu, calling himself for a time Harunobu II, and, according to Brown, "confessing to having forged a number of the true Harunobu's prints as well as signing that artist's name to work of his own." Brown goes on to say, regarding the works that he produced while under Dutch influence at Nagasaki, that they "are among the curiosities of Japanese art."

Examples of copper-plate printing found in the books of our exhibition are the following: An illustration of Reseda odorata dating from 1835 (Exhibit No. 25), maps in the history of Okinawa (Exhibit No. 59), and maps in a work on geographical exploration of Ezo (Exhibit No. 70).

Lithography, much later in Europe than intaglio engraving, came correspondingly late in Japan. The second edition of Iinuma's Sōmoku Zusetsu (Exhibit No. 29) contains a lithographic portrait of this botanist which Anderson (1 , p. 55) says is "probably the earliest effort of the Japanese at this process of reproduction." The date given (1869) is two years too early, and perhaps the date of signing a preface. In order to perfect the art of lithographic printing, Japanese observers were sent to the United States, and an American and an Austrian were invited to Japan to help introduce it. An eminent Italian expert in engraving and printing, Chiossone, was invited to take a position in the Printing Bureau at Tōkyō in 1875.

Experiments in foreign methods of type founding were going on simultaneously with those in lithography, and also in the further application of recess engraving on copper and steel. It was not until 1870 that the making and use of Western-style type was perfected in Japan, and a botanical book of 1878 (Exhibit No. 112) is an excellent example of type-setting in both Chinese characters and katakana. The hundred obviously engraved black plates of the same book, showing no evidence, however, of intaglio printing, were probably printed from transfers of recess-engraved original plates to stone by a photographic process, for Ryū tells us that lithographic printing was introduced into Japan at the time of the opening of Edo harbor to trade, and came to be practiced at the end of the Edo period (1868). A book of 1885 on Rhodea japonica has early color lithographs (Exhibit No. 46). Another later work is included to show some of the best examples of botanical illustration by lithography before the craft was supplanted by tricolor half-tones, namely, the remarkable illustrated flora of Japan in which Makino collaborated with the Tōkyō Research Institute of Natural History.

Half-tone printing has no place in the books of our exhibition, for it started in Japan only about 1883, after experimentation by Hori Kenkichi who based his work on a translation of a French book. Ten years later Ogawa brought back a half-tone process from America which was widely used. The tricolor method was experimented with in 1900 and first successfully used in 1902 on a magazine cover. It is now the ordinary method of producing botanical color plates. Japanese have been markedly successful in their collotype printing, but that, also, came too late to have been used for the old-style botanical books. So the two borrowed European methods of illustration that the botanists of the Edo and early Meiji period had experience with were copper-plate (possibly also steel-plate) engraving and lithography, the latter for illustrating in both black and color.

TRANSITION TO WESTERN-STYLE BOOKS AND ILLUSTRATIONS

Among the works showing transition to Western techniques of book-making and illustration none is more interesting than one of 1878 with the preface signed by Sakurai Tsutomu, Dai-Nihon Jumokushi Ryaku (Abbreviated history of Japanese Plants). One hundred species of woody plants are described and illustrated often without either flowers or fruit. The text is type-set with classical Chinese characters supplemented by katakana, with scientific names in Roman, and the plates for the illustrations seem to have been engraved by a pantographic process on steel, or maybe copper. Each is printed in halves from two plates on two sheets, in the manner of the old double-page wood-cuts, and the extremely heavy paper shows no impress of the plate edges, which would be expected to show, especially if the paper had been moistened for making the impressions. Copper plates would not have withstood the enormous pressure for dry-printing with paper as heavy and dense as Bristol board, such as this book is printed on. The printing would seem to have been of an experimental sort, and the edition was probably small. The engraved plate captions are in Chinese characters and hiragana, but the typographic text has Latin names in Roman. The edges are full gold-leaf, and the binding of European style. Each species has an illustration showing a planed surface of the wood, as though the author (or at any rate he who signed the preface) were a specialist in the study of wood, even though Director of the Government Geographical Bureau. No other people have ever derived such aesthetic satisfaction from the natural grain of unvarnished wood, whether smoothly planed or weathered, as the Japanese, so it seems quite natural to find that they had a relatively early work illustrating the texture of their own native woods for the purpose of identification and description. One suspects this to be the same work listed in the Leyden Catalogue (Serrurier No. 994) as "Aperçu des arbes du Japon."

THE MAKE-UP OF OLD CHINESE AND JAPANESE BOOKS

Old-style Japanese printed books of the Edo period were made up in Chinese format, in from one to many parts and volumes. By the time that books came to be published in great numbers after the unification and rule of the country by the Tokugawa shōguns, Chinese literature had already reached maturity many hundreds of years before, and much of it existed largely in the form of extended encyclopedic works and uniformly published collections of books corresponding not a little to President Eliot's "Five-foot Shelf,"

although of course vast numbers of independent works as well were appearing constantly. These were freely borrowed for publication in Japan, using Chinese characters (which mean the same in any language, since basically they represent an idea rather than a sound) supplemented by Japanese hiragana or katakana syllabic characters when these were needed to represent sound and termination of Japanese words.

There were some type-set Japanese books, but in the main printing was by wood-cut. A manuscript in the exact form in which it would appear printed was prepared by the author himself, or from the author's copy by a scribe, with collaboration of the artist if the book was to be illustrated. The pages were pasted on smooth hard-wood blocks, face down in pairs side by side but with a space between arranged, of course, to agree with the Japanese method of reading a book from right to left. In the narrow space between the pages was pasted a strip on which was written, vertically from top to bottom, a running head, consisting of title, part or volume number, and number of the leaf. A publisher's scribe would prepare the entire layout for a printing block on one sheet.

The next operation was the cutting of the block by the engraver, using knife and chisel to rout away the wood around the lines of script and illustrations so as to leave in rather high relief the remnant of the original surface that was to be inked as a mirror image of the manuscript, now entirely destroyed. Corrections, if necessary, had to be made by cutting out part of the block, plugging in a patch with a fresh surface, and re-engraving.

The soft paper used for the cheaper old-style books was nearly always thin, soft, highly absorbent, and semitransparent. It could therefore be printed on one side only. So the printed sheets were folded down the midline, right through the middle of the running head and folio-numbering, and assembled into book form with the folds outward, and the unprinted half-sides in contact. The single edges were sewed together in a flexible cover to make a volume or maki. This volume with doubled leaves could be much more easily read than one with soft thin single leaves would be.

Regardless of size most of the Japanese old-style books were made up of doubled single leaves. All such are therefore intermediate in format between our folios and quartos. Each folded leaf, however, corresponds to the single leaf of a European style book, printed on both sides, but has only one number, like the folios of older books. So it seems reasonable enough to call the folded sheets "leaves," and in referring to illustrations printed in halves and carried across from one leaf to another, many of which we reproduce, it has

seemed convenient to hyphenate the numbers of the two leaves. So we have given such references as "leaves 4-5."

The title of an old-style Japanese book is generally on a slip pasted to the cover of each volume, with the number of the volume. Three-volume works often have the volume numbers replaced by the characters for "heaven," "earth" and "man." If the title slip has worn off, it is sometimes found to have been replaced in manuscript by some former owner of the book. What corresponds to a title page may sometimes be found pasted to the inside of the first cover, but often there is none. The book may begin with no title page at all, but perhaps with one or more individually leaf-numbered prefaces by friends of the author or the illustrator. Then the title and volume number will usually be found at the upper right of the leaf numbered "1" on which the author's own text begins.

During the course of publication each individually leaf-numbered part, no matter how thin, was likely to be put on sale for early subscribers or buyers as an individual volume in a flexible cover, this being a maki. After completion of printing several of these small volumes might be combined, so we have works issued by the publisher that have to be described as "9 volumes in 3," etc., with the outer title slips reading "volume 1," "vol. 2," and "vol. 3," but the titles and volume-numbering and leaf-numbering within corresponding to the original 9 volumes or parts.

Reprints of various dates, variously assembled, were often made from the original blocks. Finer lines might have become broken or crushed from repeated use or careless handling, and there would inevitably be some difference in the inks used in successive printings of books with colored illustrations. Consequently, copies that would be exactly the same in text and illustration might differ in date and beauty of printing as well as in quality of paper, number of volumes, etc.

There was of course printing from moveable type as well as from entire carved wood-blocks, and the latter differed in style of the Chinese characters from meticulously drawn ones of classical form to the most careless or individualistic cursive forms which nowadays present great difficulty even to Japanese who have been brought up to read modern type-set books. The cursive characters often have to be guessed at and the meaning then verified by consultation of a special dictionary. Most of the writing of the block-printed books is described in the Serrurier bibliography as "semi-cursive." Classical Chinese characters would generally be combined with clear angular katakana, but cursive ideographs with the more

variable curved and flowing hiragana, with which they were more conformable.

MANUSCRIPTS OF UNPUBLISHED WORKS; PUBLICATION BY MANUSCRIPT COPIES; MANUSCRIPT COPIES OF PRINTED BOOKS.

Perplexities in collecting Japanese books arise, when a manuscript is offered for sale, in guessing or learning if it is a late copy of a printed work, made by or for some scholar who could not secure the original, or is one of several old copies which were prepared simultaneously, and never otherwise published, or possibly even a draft of the author's manuscript, that preceded publication.

In view of the way in which most books of pre-Meiji Japan were printed, the author's manuscript, if prepared with production of the final printed pages in mind, must often have been destroyed in the process of preparing the wood blocks. If an author's copy was not written with a view to such use, it would have to be copied again before wood blocks would be cut. Manuscripts are therefore often copies of printed works.

The early European collectors of Japanese books, such as von Siebold, Nordenskiöld and others whose collections are now in the Library of the University of Leyden, at Stockholm, and in the British Museum, contain manuscripts of works that may never have been printed. Dealers in Japanese books frequently offer manuscripts, which, if unrevised copies of printed works, are of course less desirable than printed copies would be. On the contrary, they may rarely be works of some importance that were never published. They are not infrequently unsigned. This is likely to be true of notebooks and collections of drawings and paintings, which vary from copy-books and other efforts of unknown beginners to the memoranda and unpublished drawings of well known illustrators and artists, whose work may nevertheless be quite unidentifiable.

The best example of an important botanical work published in manuscript is the great collection of illustrations and descriptions of Japanese plants by Iwasaki Tsunemasa (No. 10[9]) which was begun as a printed work in 1828 and later continued by the distribution of a few hand-colored manuscript copies at the rate of three or four volumes a year during a quarter of a century. It was first printed as a whole in 1920, when it appeared in 93 volumes, with 2 volumes of index, edited by Shirai.

EXTENT OF PRE-MEIJI BOTANICAL LITERATURE

It would be interesting to have some idea of the extent of Japanese literature in general and of botanical literature in particular down to the time of the restoration in 1868. Even after that time and down to the present there have been many books in the older rather than the newer traditions. The more popular books of botanical illustration, especially those which are primarily classified as art rather than natural history, showed no abrupt change. Japanese botanical literature retained a pre-Meiji aspect down to about a decade after the restoration.

A census of the pre-Meiji and post-Meiji botanical books in the older tradition might indicate about 500 titles. The number would of course depend upon inclusiveness of horticultural, agricultural and medical works, upon the amount of botany that would qualify a book on topography, natural products, or technology to be included, upon the vague limitations in the direction of art, and upon the number of relatively unchanged editions to be included. A list of 100 titles would easily include one edition of each of the basic works in all aspects of the botany of the natural history period. Since the more outlying categories of botanical books would also include animals and maybe a few fossils, rocks and minerals, there would be so much overlapping that a list of 150 titles might cover the important works in the whole of natural history, and a list of 750 cover it rather inclusively.

Admittedly these guesses are not too reliable, for many of the books are unknown except in Japan. The upper estimate of 500 is admittedly based upon the number of botanical or marginally botanical items that were included in Serrurier's catalogue of the Japanese books at the University of Leyden in 1896. These were very roughly counted and classified as follows:

Encyclopedias; Chinese-Japanese dictionaries; general compendia	8
Bibliography	6
Herbals; floras; monographs of groups; botanical commentaries on old authors; terminology	50
Agriculture, horticulture, books on plant industries and technology	42

Topography; geography; natural products	50
Travel; ethnography; guide-books	20
Materia medica	17
Art; landscape design; flower arrangement	50
Total	243

This count is very liberal in some parts of the classification, for some provincial descriptions are included even if not actually known to deal with plant products and may be entirely non-botanical. On the contrary there are known to be many books in the art field, not listed by Serrurier, but available in this country in the Ryerson Library (see Toda, 90) that depict plants with great fidelity. If the several early travelers who assembled the Leyden collection got nearly 250 works, and if it be assumed that they may have secured half of what there was, in the whole range from botanically important to trivial, we arrive at 500 as a possible number. It must be remembered that this collection includes that of the great naturalist von Siebold who gave especial attention to works in his own field of interest.

The lower estimate of 100 is arrived at by a little more than doubling the 31 titles in the Japanese appendix to Merrill and Walker's Bibliography of Eastern Asiatic Botany (47) with addition of those titles which, because of a few Latin names, are included in the body of that work, as being partly in a European language.

Neither the upper nor lower estimate is intended to give more than a rough idea of what a librarian or botanist might look forward to assembling if his objective were to make a select, or representative, or fairly complete book collection in the field of pre-Meiji botany.

Other lists of Japanese books add a few natural history titles to those in Serrurier's catalogue. Especially important are those of Anderson (1), de Rosny (58) , Brown (12), Toda Kenji (90) , and, above all, Shirai (70, 71), although the latter work does not have transliterated titles or notes in a European language.

A rapid perusal of the British Museum Catalogue (11) under the headings where books with some botanical content might be found (and classification of some titles is difficult) gives a count as follows:

Agriculture and Botany	55
Encyclopaedias	22
Natural History (including Natural Products)	21
Medicine (only if possibly including Materia Medica)	62
Geography	29
Travels (and Exploration)	44
Art (unless obviously non-botanical)	50
Total	283

It seems likely that so old a collection derived from so many sources might be assumed to have half of what is important. Such a guess as this would indicate that old-style books of botany or books with some perhaps slight botanical bearing might number 600, but it would be difficult indeed to assemble so many.

Louise Norton Brown (12) said in 1924 of the illustrated books of old Japan: "There are literally thousands of these illustrated books by means of which the Japanese historian can reconstruct the past life of the country. It would require a large volume merely to list such as are easily available, and even a superficial acquaintance with them is enough to give the foreign student an immense respect for a people who so manifestly for hundreds of years have been book-lovers and seekers after knowledge." She and the others (including Fenollosa), whose collections have found their way into the rich and important Ryerson Library of the Chicago Institute of Art, so obviously gathered books of art and general literature in preference to science, that we have not counted the more or less botanical items in the Catalogue. It contains many books with historically interesting illustrations of plants, but mostly such as kachō rather than those more strictly classified as botany or general natural history.

CLASSIFICATION OF JAPANESE BOOKS ON PLANTS AND ANIMALS

The difficulty of classifying is perhaps no greater for Japanese books than for those of any other country. If one is concerned with bibliography in general, the books incidentally containing plant illustrations and descriptions would go primarily under various subjects other than botany, and one collecting botanical books with the objective of historical study would expect to find them so listed here and there throughout such a bibliography as Serrurier's "Catalogue (66)."

The earliest ones are encyclopedic, or on materia medica, or on agriculture. Only considerably later are there books strictly about plants, and any well balanced collection in the history of Japanese botany will contain books on natural history in general. As would be expected, certain books on agriculture, horticulture, landscape design, technology, geography, and art have continued to be botanically interesting from the time of earliest publication down to the present.

So the Clements Library exhibition contained a diversity of kinds of books. Since the collector was at first most concerned with getting the items that were more particularly Japanese in character there is less than a proportional representation of early Japanese editions or adaptations of Chinese works, which were nevertheless exceedingly important in establishing in Japan a Chinese technical vocabulary for plants and materia medica. Likewise the exhibition contains little in the way of separately issued prints as contrasted with book illustration, for they were part of popular art rather than science and were largely neglected by Japanese naturalists themselves, since the majority of them illustrate relatively few species over and over again. Their great significance, from the standpoint of botanical history, lies in the fact that the skill of some of the same illustrators went into both book illustration and art prints and the high quality demanded in their art work was reflected in the natural-history drawings. One cannot overestimate the importance in the advance of natural history that resulted from the popular enthusiasm for ukiyo-e art of the naturalistic, truth-telling sort, and of publishers' preference for the services of the most competent artists.

Old, mostly pre-Meiji Japanese books of botanical interest may be classified as follows. The exhibits in Part II (pp. 395 to 552) are grouped in accordance with this classification.

(1) Encyclopedias and related works (Exhibits 1 to 4)

(2) Herbals and related works of natural history with special reference to materia medica (Exhibits 5 to 9)

(3) Works on medicine with some reference to natural history in connection with materia medica (Exhibits 10 to 11)

(4) "Famine herbals"; description of wild plants available for food in time of famine (Exhibits 12 to 14)

(5) Early monographic botanical and zoological works showing little or no European influence (Exhibits 15 to 20)

(6) Pioneer floristic works of Japan and related areas; European influence (Exhibits 21 to 30)

(7) Economic botany in general (Exhibit 31)

(8) Agricultural botany; agronomy (Exhibits 32 to 34)

(9) Horticultural botany: special groups; horticultural hobby specialties (Exhibits 35 to 54)

(10) Books on geography; famous places; travel; exploration (Exhibits 55 to 72)

(11) Books on plant and animal raw products, technology, manufactures, and trade (Exhibits 73 to 75)

(12) Botanical commentaries on ancient literature (Exhibits 76 to 77)

(13) Books of art or single prints illustrating plants; artists' sketch books (Exhibits 78 to 89)

(14) Books of art or single prints following the kachō tradition of "flower and bird" painting (Exhibits 90 to 101)

(15) Books of art and prints following the tradition of painting of the conventional "flowers of the four seasons" (Exhibits 102 to 103)

(16) Books illustrating ikebana, the art of flower arrangement (Exhibits 104 to 106)

(17) Books of Japanese garden craft and gardens (Exhibits 107 to 110)

(18) Textbooks showing the beginning of the Western influence (Exhibits 111 to 112)

ENCYCLOPAEDIAS AND DICTIONARIES

Japanese encyclopaedic works are not easily classified. The more inclusive of the old ones were by no means like ours but frequently consisted of mere descriptions, names and pictures of things or concepts, omitting persons and events. Some were hardly different from herbals. The largest one of the Edo period was based upon the Chinese encyclopaedia of Wang-khi, originally published in 1609, which, considerably expanded by the Japanese editor Shimayoshi Ankō, who added volumes describing the provinees of Japan, appeared as Wakan san-sai-zue (The three kingdoms of nature in Japan and China), 105 parts in 80 volumes, 1714. This important work, however, was by no means the first. The copy of Paris was brought to France by Isaac Titsingh and described by Rémusat (56).

Encyclopaedic dictionaries have had a long history in Japan, and the making of them doubtless began when Japan first undertook to assimilate Chinese culture, and her scholars needed, in order to write about anything at all, to know what the Chinese idiographs meant in Japanese. Shirai tells of the compilation by Minamoto no Shitago from 925 to 929 A. D. of the Wamyōruijūshō , a dictionary of the Chinese names of all things, with Japanese equivalents, in 18 volumes. This has had many editions from 1517 to those of recent date, some abridged, but that of 1798 was especially good. This was the one which, according to the British Museum catalogue (11) appeared as Yamatomeiruijūshō . The printing of extensive books in Japan goes back at least to the year 1080, but those older than the seventeenth century are rare and too highly prized in Japan to be sold abroad and even those of the first half century of the Edo period are exceedingly uncommon. They correspond in rarity to European incunabula.

The earliest encyclopaedia in our exhibition, Nakamura Tekisai's Kimmō-zui (Exhibit No. 1) is in the nature of a "Child's Book of Knowledge," for it is a picture book covering almost everything that could be pictured, published in 1666. Toda Kenji (90) says that it was the first illustrated Japanese encyclopaedia. It seems to have been the first Japanese work dealing with natural history that was referred to by a European author, for it was taken to Europe by the pioneer in Japanese natural history Engelbert Kaempfer, and

the references are in his own Amoenitates Academicae (37) of 1712, on the plates illustrating tea, lacquer, and an epiphytic orchid, where tiny accessory figures are attributed to the Kimmō-zui without indicating its author. (See Exhibit No. 1) There are other references in the same author's History of Japan.

Kaempfer's collection of Japanese books, as listed by Scheuchzer (38), who was engaged by Sloane to translate the History of Japan from the German manuscript into English, (which was again translated into Dutch) included, beside the one described as an "herbal," an illustrated book on birds, a book on minerals, stones, corals, etc., an illustrated book on agriculture, and many others, as well as a collection of maps. Kaempfer had seen and listed others in Japan, which he was apparently unable to procure, including two books containing nearly a hundred illustrations of fish, crabs, mollusks, and other aquatic animals.

It is naturally the so called "herbal" that interests us most, entitled by Kaempfer Kinmodsui (Kimmō-zui) which is described by Scheuchzer as divided into eight books, with the pictures of about five hundred plants. Kaempfer seems not to have had the entire work. Scheuchzer calls attention to a reduced copy of the picture of tea from the Japanese "herbal" inserted on one of the plates in the History. Shirai (70, 71) comments that the Kimmō-zui illustrated all visible objects, with Japanese and Chinese names affixed, "for the use of ignorant boys, to instruct them by intuition in the names and Chinese ideographs denoting those objects." Despite Shirai's disparaging words, this old children's compendium is a treasure, for its pictures display the whole extent of popular knowledge of science and technology in early Edo Japan.

The Kimmō-zui has the peculiar arrangement that each page is divided by vertical and horizontal lines into quarters. The text at the top of each quarter is very slight, consisting chiefly of the supposedly correct Chinese ideographs for the thing figured, followed by synonyms, both Chinese and Japanese. (In order to illustrate more things of greater general interest than might be found on any single page, we have made up a "synthetic" page of four quarter pages from different parts of the work, but also show another unchanged full page. (See exhibit No. 1).

Of the several later encyclopaedias the next that we are able to show is the Illustrated Book of Things Chinese of 1719 (Exhibit No. 2). In this one the text is hardly more than Chinese and Japanese names. The figures are of the same antique cast as those of the Kimmō-zui of 1666, but in some of the volumes nine on a page, and

the arrangement of some of the parts is very similar. Lest it be thought that such works were not highly important in Japanese science and education, even if harking back to Chinese prototypes, it must always be remembered that the establishment of synonymy of plant names between Chinese and Japanese was a process that took centuries, and that it was essential to the adoption and development in Japan of the Chinese written scientific nomenclature, which in that country and in Korea as well as in China, quite as essential as Latin was in Europe at the same period, because the only early writing in Japan was in Chinese ideographs. Syllabic systems developed later, after Japanese culture, largely a reflection of Chinese, had become well established.

We may now turn to the third of our children's encyclopaedias, one of 1789 (Exhibit No. 3) which was prepared to supplement Nakamura Tekisai's then antiquated Kimmō-zui of 1666, of which, however, it seems from too vague bibliographic mentions, new editions were still to be issued until 1849. The work of 1789 was definitely intended as a supplement to the older work and not an edition of it. In the preface it is stated that the supplementary encyclopaedia had been prepared by Nakada and Kawabe; that although Chinese characters were employed as titles of illustrations, Japanese names were primarily employed; that the drawings had been made from familiar Japanese objects when possible, but that if things were included that were not known to exist in Japan, foreign sources had been drawn upon for illustrations; that reference books were mentioned; and that the objects included were chiefly those omitted from the original Kimmō-zui.

The illustrations, however, show the greatest departure from the style of the old encyclopaedias. The rigid formalism of the quartered pages and the unrealistic figures are largely a thing of the past. A few figures, however, although rearranged and improved, show traces of their origin from the old work. The greater part are entirely new. Each page has text above and generally a pleasing scene below in which several related things are shown. If a scene could not be invented, as, for example, when too many objects had to be shown, they were merely grouped.

This encyclopaedic work, therefore, marks a real departure in that it is so largely Japanese in subject matter and illustration. Its authors broke away from rigid dependence upon Chinese models, for slavish copying in the future could only retard knowledge.

Synonymizing had been carried as far as was then profitable. It was time to "study nature, not books." Nakada and Kawabe deserve

all credit for saying that they illustrated things that they observed around them, and made enquiries before drawing unfamiliar things. If it be said that these illustrated encyclopaedic dictionaries were for the ignorant children and were not intended for the learned we must retort that Japan must have been full of highly intelligent and remarkably inquisitive children! The children's books could not have failed to instruct old as well as young.

Even if it was time to break away from Chinese models it is not to be supposed that the long period of dependence upon China was scientifically unfruitful. There is of course a great overlap in the distribution of plants and animals of China, Korea, and Japan, and great scientific progress came from recognition of identities and close similarities of genera and species through a broad range. The result of the scientific synonymizing and dictionary making was that the characters used by the Chinese for writing names in botany and zoology came to designate the same or similar things in all three countries. This was a great achievement. Only later could come the period of building on this good foundation of having scientific written designations (even if they were sometimes generic and not pronounced alike in the three countries) for a majority of commonly distinguished natural productions.

The old encyclopaedias in the Clements Library exhibition or other similar ones might of course be included as basic works for almost any exhibition of old Japanese books, for showing the state of astronomy, geography, technology, architecture, transportation, ethnology, zoology, etc. If it seems strange that the first Japanese botanical work shown is part of an encyclopedia, it must be remembered that Japan made wholesale borrowings from the already ancient and mature literature of China, and found encyclopedic works more readily at hand than separate specialized books on various subjects. Even the works known as "honzō," Japanese equivalent of the Chinese "pents'ao," roughly translated as "herbals," were treatises on the three kingdoms of nature, with primary emphasis on the plant kingdom, which supplied most of the drugs.

SOME OF THE GREAT NATURALISTS

Pre-eminent among Japanese botanists, Kaibara Ekken (1630-1714) was the universal genius of his time. Shirai says: "He was at the same time philosopher, man of letters, physician, geographer, historian, agronomist, and naturalist. He wrote books on sixty different subjects in two hundred and seventy volumes . . . . " His great work the Yamato Honzō (Exhibit No. 9) was published between 1707 and 1715, having been completed after his death at the age of eighty-four. It was so comprehensive and so largely botanical that it must rate as the first general flora of Japan as well as the first distinctively Japanese work on materia medica. It would be a foundation work for any collection of books or general Japanese natural history or natural products.

Writers variously give 1707, 1708, and 1709 as the date of the first edition of the Yamato Honzō, but 1709 was apparently the publication date and 1707 the date of completion of writing or beginning of printing. Our older copy is identical in content with that used by Shirai in editing the modern edition. The title slip for the illustrations indicates that they should be in two parts. The eighty-four double leaves of figures are consecutively numbered but leaf 55, the first for the birds, which follow the plants, actually has a marginal title to show that it is the beginning of part 2. The postface also indicates that the work is complete. The issue of 1715 is identical in content, but added to the title slips, after the words Yamato Honzō are the characters meaning "Revised." No revision, however, is apparent, except in the issuance of the original text, appendices and figures at one time and in 10 binder's volumes instead of 6.

The preface says that the Yamato Honzō was the result of Kaibara Ekken's life work, from early childhood up to the age of 79, that throughout his life he read books on plants, and natural products, studying as well the forms and utilities of all things, both Chinese and Japanese. His great scientific advance came through not forcing the use of a Chinese name for a Japanese plant unless it was clearly applicable or had already become well established. Instead, he preferred to admit that it had no literary history, and describe it under a Japanese name. He included references to literature in general, not merely to writings about plants. His book was printed in clear Chinese characters supplemented by simple kana (katakana, syllabic characters) to make reading easy. He did not include any groundless or false reports. So, in critical and scientific acumen Kaibara was ahead of his time.

In the original text of the Yamato Honzō Kaibara described 1362

things. Of these, 772 were to be found in the older honzō (herbals); 203 had been found in other miscellaneous writings; 358 Japanese objects under Japanese names and 29 foreign things were described to which no reference had been found either in herbals or other writings.

Kaibara treated as independent objects, for the purposes of description and classification, a few products derived from organisms. Thus, "mummy" appears as a sort of human being. Similarly, among inorganic things we find, of course, water and salt, but likewise salt water, as a special kind of water.

The illustrations of Kaibara's great work vary greatly in quality. Some are copies from the Chinese herbals or the author's Japanese contempraries and predecessors. Many have not been seen elsewhere, and are probably original. The animal pictures in general have the appearance of being better and later than those of the plants.

Inō Jyaksui (Inau Jakusui) (1655-1715) was contemporary with Kaibara. He was also an editor and commentator on the Pents'ao Kang Mu. Aside from publishing other works (of which, unfortunately, no example is available for exhibition) he began the compilation of a great encyclopedia of natural products which was planned to be completed in 1000 volumes. Of these 362 had been finished when he died. The lord of Kaga presented these to the Tokugawa government in 1719, and the Shōgun Yoshimune in 1729 ordered the work to be completed as originally projected. This was done by Niwa Seibaku, pupil of Inō Jyakusui. This enormous encyclopedia seems not to have been printed.

Matsuoka Joan (Matsuoka Gentatsu) of Kyōto was a friend of Inō Jyakusui and followed him there as a leader in natural history. Inō had written on edible wild plants as early as 1675, but Matsuoka edited from Chinese works what may have been the first Japanese "famine herbal" in 1716 (Exhibit No. 12). It was an edited reprint of three Chinese works on natural resources available in time of famine, with illustrations. Such works had been found useful in China when the crops failed, and proved to be equally so in Japan. (His, and another, are described under the heading "Famine Herbals.")

Matsuoka Joan was the author of so many other works that only those included in the exhibition can be mentioned. He wrote on the flowering plums (Exhibit No. 37) and a book on crustaceans and molluscs (No. 19) which is shown with the botanical books to indicate that even judged by his specialized shorter writings he was a general naturalist. The short monographs have titles beginning with his most usual pen-name, "Igansai."

One who examines the work on orchids will find that it contains a selection of choice large-flowered plants, trees such as Magnolia as well as herbs. This is because many but not all of the plants whose names are compounded with the simple word "ran" are orchids, but not all orchids are "ran" and not all "ran" are orchids. The classification was aesthetic rather than scientific, or if based on definite properties of the plants may have had relation to odor instead of form. So in the Igansai Ranhin there are plants of various families.

Ono Ranzan (1729-1810) was a pupil of Matsuoka Joan and continued along the same lines, but in the opinion of Shirai (71) excelled him, being one of the three great figures of the natural history period. He was born after Kaibara and Inō were dead, but the love and knowledge of plants had been passed on to him through Matsuoka. He edited a new edition of the latter's famine herbal in 1799 with new and more illustrations (for the old blocks had been destroyed by fire at Kyōto in 1789. Of his numerous works we are able to exhibit (No. 22, 1st, 2nd eds.) two editions of the beautifully illustrated work for which he is best known to Western botanists, written in joint authorship with Shimada Mitsufusa who is known under a confusing number of pen-names (Shimada Mitsufusa, Shimada Terufusa, Yonan Den, Yonan Si).

According to the prefaces, this work was started by Shimada alone, but he found himself too busy to carry on with it after he had finished the second volume of eight. He then asked and received aid from Ono Ranzan, who is supposed to have done most or possibly all of the work for the six succeeding volumes. That Shimada may have continued to participate is indicated by quotations throughout from works that have not been alluded to by European bibliographers and may not be known except in Japan. If these were manuscripts by Shimada, and if much of the material of the Ka-i had already been written by him in some other connection, then, of course, Ono Ranzan may not have done the lion's share.

The Ka-i was the second Japanese botanical work that appeared as a whole in a European language. Savatier and Saba (62) translated it into French, and it was published in 1875, but unfortunately without the pictures. (A somewhat similar work, translated into English, fully illustrated, was published in the United States in 1871.) The Ka-i was one of the three Japanese works of which was made use in the writing of Franchet and Savatier's Enumeratio Plantarum in Japonia Crescentium (1875-79). The others were those of Iwasaki Tsunemasa and Iinuma Yokusai.

Shirai (71) wrote a biographical sketch of Ono Ranzan for the

hundredth anniversary of his death. He classified Ono as one of the general naturalists on account of the great commentary on the Honzō Kammu and a monograph on birds, but most of Ono's published work was botanical. He left many unpublished manuscripts. His lectures were extensively copied and much esteemed. In his 71st year he was called to Edo to lecture in the College of Chinese Medicine. Beginning then, in 1880, and continuing until 1905, he made annual excursions to the mountains for natural history study. Among Ono's students was Ohara Genzaburō, whose chief work, a miscellany of natural history, we are able to show. (See Exhibit 7). Ohara was the first to hold a post established by the lord of Kii for investigating the natural products of the region of Wakayama, and wrote a treatise on the resources of the province of Kishū.

Later general naturalists, if represented by books in our exhibition, are mentioned in other connections, for only their botanical works are likely to be represented in the collection.

THE FAMINE HERBALS

As the name implies, the books called "famine herbals" described and illustrated uncultivated plants that could be used as food in time of scarcity. They formed a distinct group from books on foods or food plants in general, which dealt mainly with agricultural plants and products, but sometimes included some of the wild edible plants. The first famine herbals were borrowed from China. The well-known naturalist, Matsuoka Joan, prepared a collected Japanese edition of two such works in 1715, using as a general title that of the longest of them, namely, in Japanese, the Kyūkō Honzō, the other being the Kyūkō Yafu together with its supplement, the Kyūkō Hoi. This work (Exhibits Nos. 12 and 13) long remained the chief source of information for authors of later books of the same sort. The wood blocks from which the first Japanese edition was printed were burned in the great Kyōto fire of 1789. The edition of 1799 (No. 969 of the Serrurier Cat.) for which the editor, Ono Ranzan, is said to have written an additional volume, was therefore from new blocks. (We have not seen this edition.) An 8-Volume commentary on the Kyūkō Honzō by Iwasaki Tsunemasa was never printed but exists in manuscript, and a similar work by Ono Keiho, the grandson of Ono Ranzan, was published in 14 volumes in 1842. (Shirai; cf. no. 269 of de Rosny, 58).

The copied woodcuts in the Japanese edition of 1715 of the earlier Chinese work included by Matsuoka Joan in his Famine Herbal

exemplify the crudity of most Chinese botanical illustrations of the time in comparison with those of purely Japanese origin that soon followed. Vol. I contains the Kyūkō Yafu as part 1 of the whole work, with 60 illustrations, and part two, in the same volume, is the Kyūkō Yafu, Hoi, this being a supplement, also with 60 figures. The pictures, with a few exceptions, are so unrealistic that without the names and text most of them would be unrecognizable. In fact many are as bad as the majority of those that were printed in Europe before the appearance of the herbals of Brunfels and Fuchs. The early European pictures had been copied with progressive deterioration by one scribe after another until little semblance to nature remained, and the same may have been true of early printed Chinese illustrations. Vol. II contains the preliminary text of the Kyūkō Honzō proper and a beginning of the descriptions and figures, as part 1 of the same work. The consecutively numbered parts continue through successive volumes, parts 13 and 14 making up Vol. 8. The pictures range from a few that are almost as bad as possible to several that are really characteristic.

Another edition dated 1716 is an almost indistinguishable copy of the one described, except that the 14 parts of the main work are placed first and the two supplements follow, but this is only a matter of the title slips pasted on the covers, for if the original covers, with these binders titles, were lost, the great majority of the inside pages would be indistinguishable except for the slight differences in form of the characters, throughout all the volumes and in one double leaf of text being present in one edition that is absent from the other.

Since it has seemed so inconceivable that blocks for an extensive work in many volumes should have been completely recut for a pirated edition as soon as the first issue had appeared, it is suggested that one or the other of the copies in our collection was intended to be a facsimile edition essentially without editorial changes, and that in spite of date it was prepared long after the original had gone out of print, perhaps after the Kyōto fire. There has been no chance to compare our two copies with Ono Ranzan's Miyako edition of 1799, which may have utilized the same new blocks. Certain it is, however, that in spite of the similarity being mostly so great as to deceive the eye at first sight, the whole work was recut, with only a very few characters being replaced by others. Someone in Japan may be able to solve this bibliographical puzzle.

Our exhibition contains only one other of the several later famine herbals, but probably one of the best, namely, Takebe Seian's, as issued by Sugita Rikkyō in 1838 (Exhibit 14).

PIONEER FLORAS OF JAPAN

We have seen that the Yamato Honzō of Kaibara Ekken was the first work that could be looked upon as a flora of Japan, but it was more inclusive than a flora, since it also dealt with animals and inorganic things. The Ka-i or "selection" of plants that was issued with illustrations by Shimada Terufusa and Ono Ranzan was likewise a start toward a flora, and the latter was one of the three works that Savatier was able to find in Japan (about 1872) that he considered to contain records of plants so definitely identified as Japanese that they were cited all the way through Franchet and Savatier's Enumeratio (27).

The other two works were very much more inclusive ones, by Iwasaki Tsunemasa and Iinuma Yokusai. Savatier was the field worker in Japan who collected the botanical specimens and bibliographic materials upon which he and his co-author Franchet based their enumeration. They tell us that they had access to about 150 illustrated volumes of Japanese botanical books, of which 116 belonged to the three works that they considered important, and they do not even tell us what the others were. The Ka-i was in 8 volumes. They had a large part, 84 volumes out of the total of 93 (they and also Savatier say 96), of Iwasaki Tsunemasa's Honzō Zufu, and a complete set of the 1856 edition of Iinuma Yokusai's Sōmoku Zusetsu in 20 volumes. This leaves only about 38 volumes which they had but did not consider important enough to mention by title or author.

The two more extensive works, according to Shirai, were the great pioneer floristic efforts of the late natural history period. They show European influence. Iwasaki had become acquainted with von Siebold in 1826 at Edo. Iwasaki's work (partly in print and partly in manuscript) appeared earlier but had singularly ineffective distribution in comparison with Iinuma's.

Before embarking on his flora, Iwasaki had written an 8 volume commentary on the Kyūkō Honzō which was finished in 1817, but was never published.

Next came his excellent work on plant propagation which alone would place him among the leaders in the horticultural history of Japan. It is discussed elsewhere. Then in 1828 certain volumes entitled Honzō Zufu (4 vols., dated 1830, are in the collection: Exhibit No. 23) were printed, with uncolored woodcuts. Beginning in 1829 manuscript copies of a vastly expanded work under the same title and illustrated by water-color paintings, said to have been in 96 volumes, were distributed at the rate of about four volumes a year

until the work was finished at some time between 1844 and 1854. A set is said to have been presented to the Shōgun in the latter year, but is also said to have been dedicated to the Shōgun in 1844. There were very few copies of this elaborate work, which appeared in a modern printed edition of 93 volumes in 1920, each volume of which had supplementary pages by Shirai and Ōnuma Kōhei, giving the Latin names. It was followed in 1922 by an index in two volumes annotated by Shirai. Of the original printed work of 1828 (1830?) six volumes (perhaps all, but there may have been eight) are to be found in the Library of Congress.

Five volumes were printed in a modern edition at Tōkyō (from the copy of Seikadō Bunko, by Nihon Koken Zenshū Kankō-kai) in 1937, as Honzō tsūkan shozu (Comprehensive Herbals illustrated) from an edition of 5 vols. published in 1853. This does not agree at all with the original printed work, of which our set has only 4 volumes, but a colophon sheet on the end cover indicates that these four were published as a complete work on "mountain herbs." It was announced that forthcoming parts would be on "fragrant" and on "wet" (aquatic?) herbs. Actually one of the additional volumes in the Library of Congress which we do not have is largely on mints and the other on sedges. The volumes are numbered on the title slips pasted to the original covers as I to IV, but inside as Volumes V to VI. We have not seen the edition of 1853, nor have we been able to verify the existence of editions of 1844 and 1884 which authors have mentioned. Only a few late volumes of the manuscript edition with water-color figures are available for our exhibition, together with a collection in 4 volumes of paintings only to which the text was never added. As indicated below, some of the figures have been considered as probably copies of old and poor European originals. There are no inferior borrowed figures in the few volumes which we happen to have seen: All are artistic and botanically admirable for their time. In his article of 1926 Shirai did not mention the original printed volumes of 1828, and the illustrations cited by Franchet and Savatier are all from the manuscript edition. Their authors remark that they always cite the volume number found at the edge of each leaf, and not the number found on the cover, which, they say, is too high by four, because volume 5 as numbered on the cover, is the first volume with figures. It is surmised that it may have been intended, while it was in preparation, to appear as volume I, but was preceded by four of the six printed volumes. So throughout the manuscript edition the covers and the actual pages carry volume numbers differing by four.

Franchet and Savatier said of the Honzō Zufu: "This vast collection, giving figures in color of more than fifteen hundred species, herbs, trees, algae, and fungi, is only, to our eyes a compilation without

order, which, even though bearing the name of a single author, seems attributable to the collaboration of several artists of very unequal talent. Actually, beside certain volumes devoted more especially to Orchidaceae, Campanulaceae, Rhododendron, Hibiscus, Camellia, and Nelumbium, which testify to an experienced touch and a skilled observer, there are others in which the artist is not appreciably above the level of the figures of the Kwa-wi [Ka-i] when not actually below it. The assemblage merits so well the title of a compliation that we believe it possible to say that several designs are not made from nature, but are derived from considerably older collections, even, indeed, from European works previously imported into Japan. It is impossible to overlook in certain figures of the nature of fantasies the style of artists of the period of Pison [Piso] and Aldrovande [Aldrovandus]. These figures are those in which one sees hatching and cross-hatching intended to express shadow and relief, artifices of illustration which were not usual in Japan, as one knows, and that point irrefutably, in our opinion, to borrowings made in the fashion of foreign originals. It is, nevertheless, proper to say that borrowings of this sort are few in the Phonzo Zoufon [Honzō Zufu]. We never cite these copies. In this collection horticulture was made a large part. One entire volume is devoted to camellias and to their different varieties. Another, admirably painted, gives all the forms of Hibiscus. The illustrating of the numerous variations of the Nelumbium, the cultivation of which is held in high esteem in Japan, occupies no less than five volumes. Whatever may be the inequalities of execution of this work, it would nevertheless be interesting to be able to enumerate all the determinable species that it includes. We now confine ourselves to mentioning, in our catalogue, the rarer plants figured in this great collection."

With respect to the disparaging reference to the wood cuts of the Ka-i, one may remark that down to the time when woodcuts were largely replaced in Europe by copper-plate engraving, there were few European botanical illustrations that were superior to those of the Ka-i.

Shirai had said that the Honzō Zufu illustrated more than two thousand species of plants, chiefly of Japanese origin. The discrepancy with the number given by Franchet and Savatier is explained by the fact that the latter writers had an incomplete copy, lacking, they said, twelve volumes. They and Shirai both regarded Iinuma Yokusai's work as much better than Iwasaki's. Certainly it was technically more detailed and accurate.

Iinuma was a pupil of Ono Ranzan. He began his Sōmoku Zusetsu in 1832, and twenty volumes of it were published in 1856, containing

descriptions of 1201 species of herbaceous plants. Other parts, containing descriptions of about 600 species of woody plants, were never published but were preserved in manuscript.

A second edition was published in 1874 (Exhibit No. 29) and this one contains Latin names in Roman letters. The illustrations are both artistic and accurate. Sometimes in addition to the drawing of the plant as a whole there are excellent enlarged details, nicely hand-colored in tempera.

Franchet and Savatier describe this work as the most remarkable, to their knowledge, that Japan had produced in the field of botany, and by no means a new edition of the Ka-i as Miquel had thought it was. They say that von Siebold instructed Iinuma, and his work gives evidence of his acquaintance with European languages. The order of the work is Linnaean. The orderliness of the arrangement, accuracy of the detailed colored figures, and characteristic aspect of the black wood-cuts of the entire plants create a very favorable impression. The identification of most of the plants was given by Franchet and Savatier (27) in a Japanese-name index appended to their Enumeratio, which included also the names from the Ka-i and the Honzo Zufu. The French authors were assisted by Tanaka Yoshio, Ono Motoyoshi, and Itō Keisuke.

The second edition of Iinuma's remarkable flora was published with a preface in French and a lithographic portrait of the author. The editors were Tanaka and Ono Motoyoshi. The former tells us that they added the Latin names to the illustrations, as well as spelling out the Japanese names in Roman following the English pronunciation. They thanked Savatier, resident in Yokosuka, for verifying the scientific names. The figures are striking for the contrast between upper and lower leaf surfaces, the former rendered in white on black and the latter in black on white.

After publication of the 20 volumes of the first edition, Iinuma had continued his labors in preparation of the remainder of the herbs, namely, the Gramineae, Cyperaceae and Pteridophyta, and the whole of the woody plants, planning to bring the work up to 40 volumes. The ten volumes on trees and shrubs for which Iinuma had completed the manuscript were presented to government authorities with the recommendation that they be published, but the request seems not to have been favorably received.

Of the three botanists who were chiefly concerned in editing and promoting the publication of the second edition, Tanaka and Ono published an index to the work in 1875. Tanaka became well known as

the author of a work on the useful plants of Japan (Exhibit No. 28) and wrote various articles. He was botanically active until the end of the century, and his own publications bridged from the old to the new. Ono was known chiefly for his study of botanical terminology and for rendering of technical terms in Japanese. He wrote a botanical dictionary based upon Lindley's. Itō Keiske had a long career in botany. He was one of the group who were associated with von Siebold in 1826. In 1827 he was president of the natural history Society of Owari at Nagoya and at least twice participated in publishing its proceedings. In 1829 he published in two volumes and a supplement a catalogue of Japanese plants with Latin names, based upon a manuscript of Thunberg. When the Bureau for Western Learning was organized in 1857 he and Tanaka Yoshio became associated with it, for research in natural history, and his work matured as a descriptive natural history of twelve provinces, separately treated, published in Japanese style in 1873. In 1874 appeared Japanese plants illustrated (Exhibit No. 24) with a preface in French, by Savatier, xylographically reproduced in Japanese style. This is so interesting that we may translate with modernized spelling a bit of it, as follows:

"The great illustrated works on botany, such as the books Ka-i written by Yonan Si [Shimada Mitsufusa], Sōmoku Zusetsu by Iinuma, and Honzō Zufu by Iwasaki, accompanied by many figures, give a general idea of the flora of Japan, but still lack many things . . .

"The best disciple of Ono Ranzan (the Linnaeus of Japan) was Mizutani Sugeroku, who has written on the flora of his country. Itō Keisuke was, in turn, the favorite student of Sugeroku, at the same time as Iinuma, author of the Sōmoku Zusetsu, for which he wrote a preface. All his life he has been busy in the study of plants, and his relations with Siebold made him conversant with classifications adopted in Europe.

"At a time when Siebold studied the flora of Japan, when it was not permitted that Europeans should traverse the country, M. Itō Keisuke shared his collections and discoveries, so that the name Itō Keisuke is honorably known to all Europeans who study botany. It is quite understandable that he had found it necessary to describe the plants that he has discovered and that had not been described in the Japanese works or had not been well illustrated; moreover, that, in spite of his advanced age, he is about to publish several volumes that are the fruit of his new researches . . . Instead of tiring him, his labors seem to rejuvenate him and the passing years neither to diminish his ardor for science nor to blemish his amiable character. May we hope that even yet he may live long years to reveal still unknown

botanical riches of Japan."

Itō Keiske began his career by a study of Latin plant nomenclature based upon Thunberg, was a friend of von Siebold, and carried on research in botany for half a century to become a helpful friend of Savatier, who was delighted to pay him honor for his scientific accomplishments and his noble character. His last work, in Japanese only, appeared in 1881 and 1883, two volumes describing plants of the Koishikawa Botanical Garden at Tōkyō.

AGRICULTURAL BOTANY AND AGRONOMY

Japanese scientific literature has a number of interesting early books on agriculture, but only a very few find a place in this primarily botanical collection, included because they deal with crop plants from a more or less botanical standpoint and contain plant illustrations. We are able to show the best of the works on agricultural botany, the most expensive and finest of the pre-Meiji monographs on the cultivation of a single species, namely, that on the Japan tallow- or wax-tree (Rhus Succedanea), and two of the more interesting books on tobacco (one of them of greater ethnographic than agronomic interest, but the other, of late date, a most remarkable agronomic monograph), a modern facsimile of an old book on paper plants and paper-making, and one of the monographs on bamboo. Special books on tea, the lacquer tree, rice and other individual economic plants have not turned up, but have not been especially sought.

According to Shirai the great encyclopaedic treatise on agriculture which was begun in 1792 by the Bureau of Natural Products of Kagoshima (Exhibit No. 33) never progressed beyond the 30 volumes that were published in 1804, although it was intended that the work should extend to 100 volumes. The great fire of Edo in 1806 burned the residence of its sponsor, Lord Shimazu, where the blocks of the parts already printed were stored, and these were destroyed, as also the manuscript which had been prepared for the continuation. Sō Senshun, the chief author, was a prolific writer on natural history. The treatise begins with the usual prefaces, and through Vol. VI deals with generalities, illustrated by several very curious scenes of ceremonies and farmsteads, then with rice planting, agricultural festivals, harvesting, etc. Following volumes through Vol. XII take up surveying, irrigation, drainage, flood control, etc. Vols. XIII and XIV deal with farm tools, implements, measures, etc. The actual agricultural botany begins with the description of rice varieties in Vols. XV and XVI, followed by other cereals and the legumes in Vols. XVII through XX. Cruciferous root crops and

green vegetables come in Vol. XXI; aroids and yams in Vol. XXII; burdock, umbellifers, Amaranthus, and other miscellanea in Vol. XXIII; onions and ginger in Vol. XXIV, more miscellaneous plants, including Capsicum in Vol. XXV; cucurbits and egg-plant in Vol. XXVII; lotus (i.e., Nelumbo) and the water chestnut in Vol. XXVIII; more Cruciferae in Vol. XXIX, and a final miscellany of wildlings for famine food, ranging from Compositae to Equisetum , in Vol. XXX.

This great work on agriculture and agricultural botany is a priceless record, beautifully illustrated. The parts extant were to have been continued by those on fungi, and after the fire work ceased except on that one subject. Much progress had been made when a second fire in 1829 again wiped out all that had been done. Sō Senshu had prepared more manuscript and part of the blocks had been cut. Even then the project was not entirely abandoned, but died a lingering death. It had been a noble one in conception, and also in execution so far as it went, but could not survive the succession of calamities.

The work on the tallow- or wax-tree (Rhus succedanea) is one of the most remarkable monographs on a single economic plant in the literature of Japanese botany. Its author, Ōkura Nagatsune, evidently had great faith that the cultivation of this tree as a special crop would alleviate the poverty of many farmers. It is interesting to see that encouragement of agricultural diversification by promoting highly specialized local crops is nothing new in Japan. The preface, signed by Okuno, states that Ōkura had already written works on the raising of sugar-cane, cotton, indigo, cedar trees, Paulownia, and on paper making. Obviously he was a genuine enthusiast for special cultures! Okuno said that of the four classes of people, namely the samurai, the farmers, the artisans and the merchants, the farmers worked hardest and got the least reward for their labor. Recently, however, a few farmers had made some profit from planting wax trees. Mr. Ōkura's prospectively beneficial work on wax trees and wax manufacture had greatly impressed him, and so he had advised its publication. An English rendering of the title might be "Benefiting Farmers." Serrurier (66 , no. 1074) made it (in French) "The Profit of the Laborer." Okura's book, as we have it (Exhibit No. 34) consists of a first series of three volumes published in 1802, a second series of two volumes, with no indication of the date being later (but Serrurier says 1803) and a third series of two volumes in 1818. There were, however, later and possibly expanded editions (1818, 1820 and 1854), which Serrurier cites in indicating that the work consists of 22 volumes.

Running through this fully illustrated work gives a view of the botanical aspect of the plant, the appearance of plantings, the de-

capitation of the trees to induce a low-branching orchard-type of growth, the complete procedure of grafting superior scions into the base of old trunks, completely divested of their own crowns, the grafting of undetached branches of old trees onto young trees, the harvesting of the fruits, the flailing of the inflorescences and subsequent pounding of the fruits in a mortar operated by a pestle attached to a "teeter-totter" for operation by foot, the cooking out of the wax, and subsequent operations in the preparation and marketing of the commercial product.

The books on tobacco (Exhibits 31 and 32) are remarkably different from each other. The old one (1809) is only to a minor extent agronomic, but if not placed here it would fit best under ethnology. The author, Ōtsuki Gentaku, tells us that 15 or 16 years before writing his own, he had come across a considerable number of books in which there were accounts of tobacco. He knew twenty-four Dutch (or Latin) writings on tobacco, but seems to have used about nine. The first author mentioned was Dodonyūsu, who can be none other than Dodonaeus, but others are less easily recognizable. It is from Dodoen's herbal that the botanical illustrations were copied. Regarding the history of tobacco in Japan, he tells us that the seeds were brought by a foreign ship in the Tenshō period (1673-1687) or maybe Keichō period (1596-1614) and that plants were grown in Sakurababa, Nagasaki. (Shirai gives the same place of original planting, but 1605 as the date.) Ōtsuki gathered together a great many pictures of tobacco smoking and the implements associated with it in many countries and these are reproduced in his book. One of them may have given the Japanese some of their earliest ideas of the American Indians, for a picture is introduced of a native of Tobacco Island (!) in America smoking a long twist of tobacco leaves. This he says is from "Shomeriru's book." He mentions 29 Japanese authors on tobacco, the earliest being of the Kan'ei period (1624-1644) and others of the Tenwa period (1681[1684). He also refers to 38 Chinese authors.

By way of contrast, we show the chiefly agronomic treatise on tobacco by Aoe which appeared in 1881. It does not neglect the history of tobacco smoking, however, and gives pleasingly precise information, partly in the English legends of the 156 figures, but also largely quoted from the preceding author, Ōtsuki Gentaku. He is very definite about the date at which the Japanese were becoming acquainted with the smoking of tobacco, for a picture of a pipe is given which was made in 1577 by the order of Toyotomi Hideyoshi by Minakuchi Gombei.

This remarkable monograph is richly illustrated by 156 colored figures, many of them large, folded inserts. It deals with morphology of the tobacco plant, planting, handling and care of seed beds, shelters, transplanting, weeding, trapping moles, final transplanting, use of wheat as a "nurse" crop to prevent wind damage, insect pests, various named diseases, harvesting, curing, preparation for market, history of smoking, geography of the Japanese tobacco-growing region, grading and qualities of the product. It is probably as interesting a monograph of a single crop plant as any nation could show at the same time. From the standpoint of book-making, the format is distinctly Western except for the superficially Japanese appearance of the paper-covered parts. It is printed from type in Chinese characters and neat katakana. The leaves are not doubled, are printed on both sides. The illustrations, alas, are not neat Japanese diptychs, but big irregularly folded inserts in Western style. The pagination is Western, for both sides of each leaf are numbered. This work is one of those which began to appear in large numbers about a decade after the restoration of imperial rule and which are modern in typography. At first glance this one appears to be transitional in retaining the traditional wood-cut illustrations. These, however, have had the black outlines printed from metal, with the frame-lines of the pages and the text, probably from photographically produced line engravings on zinc. Only the colors were added with a succession of printings from wood blocks. That the color printing was actually from wood may be seen by examination with a good lens, which will show up the grain of the wood in many of the illustrations. All in all, the printing of this copiously illustrated work with its effective coloring was a marvel of technical ingenuity.

At the end of the last volume the author has an English postface, in which he abstracts the content of his work. One pleasing sentence is this: "Small kinds of birds, as sparrows, and also some kinds of bees and tree frogs, etc., are useful to the tobacco cultivator, as they eat some of the most injurious insects." One wonders about the bees, but the general sentiment is admirable. As to the history of tobacco in Japan, he tells us that the Portuguese introduced smoking when Christianity was first brought, but there was no mention at first of cultivation of the plant. About 1596 tobacco seed was imported from some foreign country and cultivated in the town of Ebusuki in the province of Satsuma. This was the first cultivation in Japan. It was reported that seeds brought by a foreign ship were planted at Sakurababa in the town of Nagasaki, and that seeds from there were taken to Shinano by a travelling Buddhist priest. From there tobacco was disseminated all over eastern Japan.

It was soon realized that tobacco was an evil in more ways than one. About 1652 a Chinese Buddhist priest admonished his Japanese brethren against its use, in Chinese poetry. The Shōgun, Prince Tokugawa Hidetada, prohibited its use for the second time in 1607, and a third time in 1609, after his first order had been disregarded. In 1609 he prohibited not only smoking but also tobacco growing. In 1611 he decreed the penalty for selling tobacco as confiscation of property, which should be given to the informer. Any man arresting a person on horseback who had tobacco in his possession should have both horse and baggage (but presumably not the tobacco!). In 1615 it was found that the officers who served the Shōgun himself, in Edo, were smoking, and the order for confiscating the property of offenders was again issued. After that, numerous edicts followed one after another, to no avail. The vice continued. A poem by the Mikado mentioned that smoking went on in his own palace! By 1624 the government began to give in to the inevitable and relaxed the regulations, but still would not allow the economic loss that resulted from planting tobacco on rice fields or in vegetable gardens. This law was in effect until 1679, when the law courts refused to listen to any further contention about tobacco. The shoguns themselves took to smoking, and had finely wrought pipes of silver and brass. In 1789 it was prohibited to ornament pipes with silver, gold, or brass. In spite of everything tobacco production became one of the chief industries of Japan.

Our agricultural-botanical books are few and the last (Exhibit No. 36) deals with a Japanese specialty, the bamboos. These have as extensive a place in Japanese life as they do elsewhere in the Far East. The Nihon Chikufu (Japanese bamboos) appears to be typeset because it is printed in such neat kanji and kana, but careful comparison of different examples of the same characters reveals the individual differences of penmanship. So it is a very late old-style book in imitation of new-style. There are no Latin names. The illustrations are beautiful black line drawings, and illustrate the chief Japanese bamboos not merely in superficial aspects, but in considerable detail, extending even to the underground parts, to abnormalities, and to diseased conditions. The pictures give little evidence that the author had a chance to study flowering specimens.

Some of the books that might be considered agricultural are best placed elsewhere, with economic products or with horticulture.

THE HORTICULTURE OF OLD JAPAN IN GENERAL AND HORTICULTURAL HOBBIES IN PARTICULAR

Horticulture was highly advanced in pre-Meiji Japan. There were a number of horticultural hobbies, some of which can be traced back to China, but others were local in origin. "Plants of the four seasons", favorite ornamentals in both countries, and generally of some symbolic significance, were for the most part the same in both countries, and the older art based upon them was very similar. For instance, the cultivation of plum and cherry goes far back, and Old Japan had special books on the ornamental varieties of each. The lotus was sacred to Buddhism and cultivated early in both countries. The chrysanthemum (kiku) was popular in both countries, and especially in Japan, because it was the emblem of the Imperial House.

Literature on ornamentals in general and their cultivation goes back at least to 1664. The work which in a later and greatly expanded edition became the standard work on Japanese garden botany was first published by the florist Sannojyō in 1695 and is included in the collection. It includes such favorites as garden varieties of peony (mutan), morning-glory, camellia, azalea, and many other plants.

Just as in America, there came to be hobby societies in Japan for growing and exhibiting particular groups of plants, or miscellaneous plants of similar utility in the garden. These horticultural hobby organizations as well as individual growers held shows or opened their gardens to their friends or to the public at times when the plants were at their best. They started special branches of horticultural literature. The growing of natural or artificial dwarf trees (bonsai) was (and still remains) a specialty of great antiquity, taken to Japan from China, and a bibliography of its special literature, dating at least from 1827, would be of imposing length, but, curiously enough, all of our numerous special publications on this hobby are too late for inclusion in the exhibition. We are able to show the standard work on variegated leaved plants (Exhibit No.52) and representative illustrated books dealing with several horticultural specialties.

The three earliest works on the chrysanthemum mentioned by Shirai were published in 1699, 1712, and 1713. The fourth, of 1715 (Exhibit No.54) is the first that we can show. The author, Shimizu, tells us that he found chrysanthemums superior to other flowers,

for they did not compete with the flowers of spring and diffused a fine fragrance late in the fall. He wished posterity to remember his love for them and so was led to write his book. The first volume (Jō) dealt with cultivation and propagation; the second (Chū) with the harmful insects and other pests, and how to destroy them; the third (Ge) with five special varieties, with the making of chrysanthemum sake (Japanese wine) and its medicinal use, with the nature of the floral variations shown by 49 varieties, and, finally, with 100 poems inspired by the chrysanthemum.

Vol. II is a pioneer contribution on pests. One finds text figures of the tender growing tip crowded with aphids, of the lady-bug who carried them there, of an eel-worm, of boring larvae, of a slug and a snail. The illustrations in vol. III begin with the varieties in which all of the disc flowers are transformed into flat ligulate flowers. Next come those with the disc flowers reduced in number but very large, surrounded by the numerous ligulate ones. In the next the disc remains the same but the ligulate flowers become transformed into quills with mouths varying in obliquity, in flare, or in having more or less of a spatulate or spoon-like appendage. All the varieties illustrated down to this date were apparently small-flowered.

The species to which the cultivated varieties are conventionally referred is Chrysanthemum sinense, but, by the time the proliferation of chrysanthemum literature began, there were already unnumbered horticultural varieties. The history of some of the chief lines of descent of the varieties might perhaps be traced far back by study of authentically dated old Japanese and Chinese paintings rather than by book illustrations, for the chrysanthemum has a long record in art because of inclusion among the "Flowers of the Four Seasons," which afforded an inexhaustible theme for Chinese and Japanese painters long before book illustration was of much significance for botanical and horticultural history.

Since the existence of numerous chrysanthemum varieties goes so far into the past there is no certainty that Mendelian or other segregation following interspecific hybridization may not have started the extraordinary diversity that already existed two and a half centuries ago. There has been considerable speculation on the subject of origin but the subject still needs more study with the aid of modern techniques.

By the time the first special book on chrysanthemums was published in 1699 there must have been hundreds of horticultural forms not as large-flowered as those developed a little later but including most of the usual morphological variations that are now

grown. Shirai tells us that this beginning of a special literature on chrysanthemums led to the publication of at least two other books before 1715, when the earliest one included in our exhibition (No. 54) appeared, namely the Kadan yōgiku Shū of Shimizu Kanji. Soon there were various others, closely spaced, leaving a record of the immensely popular chrysanthemum shows. The publication on a Kyōto show of 1717 described 710 horticultural forms and named 249 members of the exhibiting society as having attended. Such shows have continued down to the present, and must have long preceded the surviving published accounts of them.

The work of 1715 which is exhibited has as a frontispiece a chrysanthemum show. It occupies two pages of the first of the three horizontally oblong volumes, but the different shape of our pages requires the vertically divided halves of the scene to be shown one above the other instead of side by side. The house of the exhibition was opened to the garden by removal of the shutters, a characteristic feature of old-fashioned Japanese house architecture. Among the arriving departing guests are samurai, wearing their two swords, and other gentry. Sitting formally on their heels, in pairs or little groups, the guests within the house are engaged in contemplation of the flowers and polite conversation. The flowers are displayed as solitary stalks in widely spaced bamboo containers, allowing each to be separately admired.

Illustrations that follow in the second volume show diseased conditions of the chrysanthemum and some of its animal pests, such as cutworms, beetles, plant lice (with a lady-bug!) snails and slugs. This volume must surely rate as a pioneer publication in the field of plant pathology! The third volume pictures 48 types of floral morphology useful as a basis for classifying the varieties, and including most of the main genetic combinations and mutations that would be found among the varieties grown today.

Large-flowered varieties, Shirai tells us, were exhibited for the first time at Kyōto in 1717. With their appearance the interest in cultivation of chrysanthemums grew apace, and the shows became popular annual events, as they have been ever since. Published catalogues listed hundreds of exhibitors and thousands of cultural types.

Books on chrysanthemums alone were probably numerous after the first ones appeared but they are lacking in our exhibition down to some of recent date. An especially interesting one is that of Kōno Bairei, Kiku Hyakushu (One hundred chrysanthemums). Although late (1892) it was done in imitation of the old tane-e prints of about 1770-1830 in which the tints were not necessarily imitative

of nature but provided contrast. They are highly naturalistic in form but not in color, and represent an interesting experiment in reversion to a bye-gone mode by an artist remarkable in the later days of ukiyo-e art for the fidelity with which his full coloring was reproduced by the printer. Although considerably later than the date at which experts on Japanese color-printing have generally said the craft had become hopelessly degenerate, but still long before the conscious efforts at regeneration that began some decades later, Kōno Bairei produced some of the most successful flower and bird prints of any date. These will be found exhibited with the Kachō and Related Art Books.

The last of our chrysanthemum pictures are unfortunately unidentified. They are from a book taken apart by Miss Roda Selleck of Indianapolis perhaps forty or fifty years ago (in order to exhibit the prints separately) and never reassembled. They are strikingly successful in representation of form and color, and depict a considerable number of the morphological types that are found among modern large-flowered varieties.

In the 19th and 20th centuries there were so many chrysanthemum shows, so much alike even though constantly becoming larger and attracting more public attention, that few of them could be signalized by printed catalogues. Every large city had them annually, and they came to be routine and expected seasonal attractions, as much a part of the life of the Japanese people as county agricultural fairs in America.

The great naturalist Matsuoka Gentatsu (Matsuoka Joan) wrote early books on the plums and the cherries. The former (Exhibit No. 37) was published in 1760 after Matsuoka's death, which occurred in 1745, by his disciples Koga Keigen and Imaeda Eisai. The first volume dealt with white-flowered varieties, of which 29 varieties were illustrated and described. All the names were given, both Chinese and, if there were any, Japanese. The preface by Koga Keigen told how plum blossoms were esteemed in olden times above all other flowers, and how they had been anciently planted by imperial edict. In the second volume 25 pink-flowered varieties were described and figured, as well as a group of six that were of various colors. Finally, a group of flowering trees were considered that were similar to plums but were probably actually different. Some such were included that had no Japanese names, and some that were known by names ending in "-ume" and therefore should be plums, but might not be such.

Matsuoka's horticultural monograph on the flowering cherries appeared with black illustrations in (Exhibit 38). We have not seen early editions with pink and green tinting. One of later date (Exhibit 38) is so colored, however, but otherwise a copy of the original edition.

A monograph of a horticultural assemblage of plants for which the name is often translated as "orchids" was also written by Matsuoka (Exhibit 17). According to the Japanese conception the orchids were included in the herbaceous division of the plants called ran with plants of other families. The chief "hobby" orchids were of the genera Dendrobium and Goodyera. The tree division of the ran included such trees as Magnolia.

As defined by Japan's older botanists the name "ran" belonged to a category of plants that were not at all botanically related. Orchids, for example, were included among the "grass-ran" and Magnolia among the "tree-ran." As in some early European classifications by name, the concept of the group depended upon some non-morphological similarity. At least many ran were fragrant when fresh, pleasantly aromatic when dry, and would communicate their fragrance to the hair or clothing. Some orchids develop coumarin or vanillin in drying, and some grasses do likewise, so it need not surprise one to find sweet-grass included among the "orchids," if we so translate ranhin.

Only one of the several Japanese works that deal mostly or largely with orchids, Matsuoka's is one of the earliest. Serrurier renders the title of this "orchid" book as "Ornamental plants of which the name is compounded with the character "ran."

Other plants for which there was an early "hobby" literature included Ardisia (Exhibit 47), for which the first special horticultural book appeared in 1797, and Psilotum triquetrum.

The latter is a curious fern ally of isolated systematic relationship, slow-growing and difficult to cultivate. It is not the sort of a species in which one would expect to turn up many mutations. Such either originated in cultivation in numbers, however, or were perhaps spontaneous and genetically distinct forms found in nature, and of unknown antiquity. Psilotum was known to Japanese horticulture by a name which meant "pine-leaf orchid," and presumably its classification with the orchids may have come about because of the frequently epiphytic habit of both. We are able to display an apparently unpublished manuscript on Psilotum (Exhibit No. 48) and two printed works.

Another horticultural hobby that had a great vogue was the cultivation of Rhodea japonica. This plant of the lily family (known in Japanese as omoto; it has no common name in English) has only one Japanese species, and, being geographically as well as genetically isolated, can only produce hereditary variations of various types by mutation. About the same time that morning-glories were becoming so diverse by mutation, similar diversity was appearing in Rhodea. A good many of the aberrant types were irregularly malformed or streaked and spotted with white, which might suggest virus infection as well as mutation, but other types had every appearance of being hereditary. They were very numerous, and a number of books illustrated them. One especially interesting sort had the midvein of the leaves extended beyond the lamina as a tail-like curved appendage, and this mutation suggests the manner in which the same characteristic may have arisen in the rare genera in which it is a constant generic feature, as in Flagellaria and Nepenthes. This feature has appeared by mutation in other genera, Oenothera, for example, in which it is not characteristic of any established species or variety. The old books on Rhodea, of which several are shown (Exhibits No. 45 to 46) point out material which the experimentalist might find useful. In Japan Rhodea is prized as one of the "plants of winter" for its broad lustrous leaves persist through very cold weather and contrast strikingly with the red berries.

One of the nicest books on Rhodea appears to have been written after the variety with caudate-tipped leaves had died out, for the authors do not include it. They state that no detailed account of the plant had been made public, that their pictures were truthful (the implication being that some others might not be) and that in spite of extensive variation in size and color of flowers, leaves, and fruit there were actually only seven chief types.

The most interesting of the horticultural hobbies from a scientific standpoint was the growing of morning glories. Although the varieties supposedly arose by mutation from a single species, Pharbitis Nil, which is somewhat isolated, from a systematic standpoint, the possibility that hybridity rather than mutation had something to do with the origin of a remarkable plexus of very different types cannot be ruled out without experimental evidence.

The varieties show the most astounding morphological changes, ranging all the way from the familiar and normal flared flowers, with corolla round in outline, to deeply cleft narrow-petaled varieties. In some the corolla divisions are fimbriate. Some flowers show the "hose-in-hose" form, as English gardeners term a type in which one gamopetalous corolla occurs within another. The stamens of some varieties were non-functional and their large,

colored, modified sterile anthers hung out of the flowers on long filaments. The mutations are so numerous and striking that we seem to see in them evidence that the evolution of very widely different morphological types in nature need not always have required a long time.

Just as in European horticulture it has been assumed that all the varieties and forms of the sweet-pea, **Lathyrus odoratus**, have developed by successive mutations from the wild type, since no species is known that hybridizes with it, so it is presumed, until there is evidence to the contrary, that Pharbitis Nil is so isolated in relationship that its varieties are not the result of Mendelian segregation in a line of descent from a wide cross, but are actually the result of a succession of mutations. These are the horticultural forms of the Japanese morning glory, or asagao. The peculiarity of its behavior, which makes it especially appeal to floricultural hobbyists, is that its most divergent forms appear sporadically and unpredictably, and are likely to be physiologically or morphologically so aberrant, that often they can not be perpetuated by seed. They appear by chance among large numbers of seedlings, are recognized by expert growers as unusual, are singled out and pampered in every possible way in the hope that they may prove to be rare or even unique types when they flower, and bring recognition to a lucky exhibitor at a morning-glory show.

At the beginning of the 19th century morning-glory societies were rapidly formed to support the hobby of growing and exhibiting the asagao. It is truly strange that some Japanese Hugo de Vries of a century ago did not anticipate the theory of evolution by mutation, for the annual exhibitions included such strange and bizarre deviations from what might be expected that there were indications of several possible evolutionary lines of descent from the ordinary type as a progenitor. These supposedly mutational types included, it seems, remarkable somatic mutations. Some of the most remarkable ones may have been the result of virus infections, but enough of them were clearly hereditary to have provided material for generations of genetical experimentation.

So the old books on asagao ought to appeal to the geneticist, antiquated as they are, for there is nothing more interesting on the origin of widely deviating types in the whole of botanical literature. The first two of the asagao books may have been published in 1815, but by then there were already 160 different forms. These were described in 1815 by Master of Kōtendō, in Kadan Asagao-tsū (Complete collection of morning glories), and in the Kengyū Hinruikō both of which are exhibited (Nos. 39 and 40). In 1817 there were three works, namely the Kengyū Hin (Exhibit No. 41)

and in 1818 two more, of which the Asagao Fu by Master of Shūsui Charyō, illustrated by Notansai, is in the collection (No. 42). From this time on the morning glory societies of Edo, Kyōto, Ōsaka, and elsewhere held frequent exhibitions. The Asagao Zufu (Morning glory pictures) of 1854 by Naritaya Tomejirō is the latest of the pre-Meiji books in the collection. After its sudden rise, the hobby was destined to decline, but revived again.

There have been times when the cultivation of Japanese morning glories seemed to make progress in America, and some of the rare mutations were even grown and exhibited at the "Japanese Tea Garden" in Atlantic City, New Jersey, for a couple of years about 1900. This enterprise failed, however, and the hobby did not persist. It was revived in the United States by Jenny (36) who not only grew many varieties and distributed seeds to many garden enthusiasts, but also succeeded in making iterative crosses of a large-flowered crimson variety of the Japanese morning-glory as the pistillate parent with the white American moon-flower, Calonyction which some consider to be a separate genus from Ipomoea and others classify as a subgenus only. The resulting hybrid had a crimson center surrounded by white, and Jenny named it "Banzai," hoping that its cultivation would be continued by Japanese growers. He presented seeds to Japanese officials in Washington for transmittal to Japan. As a result of Jenny's efforts, in the United States gardeners grew his "Banzai" and other varieties. The interest of Mrs. Mary Cokely Wood (94) who published on her experiences, was independent, however, having been aroused during her residence in Japan, where she secured her own seeds.

INVESTIGATORS OF ECONOMIC NATURAL PRODUCTS

The Shōgun Yoshimune himself promoted the investigation of natural products and ordered provincial governors and clan chieftains to do likewise. The lord of Kii therefore established the Bureau for Natural Products of Wakayama in 1794 and placed in charge of it Ohara Genzaburō, who was a pupil of Ono Ranzan, (See Exhibit No. 7). Ohara wrote a Miscellany of Natural History, which we exhibit (No. 7). He was succeeded by Kuroda Suizan, who was a prolific author. This was also true of Satō Seigo, naturalist of the "Natural Products Bureau of Mito," who, according to Shirai, completed his Products of Mountains and Seas, in 100 parts (maki) in 1830. One of the most active of the local Bureaus was that of the Lord of Shimazu in Kagoshima, which produced in

1789 an important work on the flora of the Ryūkyū Islands and, in 1804, the first great Japanese compendium of agricultural botany (Exhibit No. 33), the latter by Sō Senshun.

Insofar as the conception of natural products drifted toward emphasis on economy, subsequent works were likely to deal only with a few selected products that were important in industry and technology. The earliest work of the more industrial sort that is included in the exhibition (No. 73) is the 5-volume work of Hirase Tetsusai, 1754, illustrating Japanese products of land and sea. (Brown refers to an earlier edition of 1730 which we have not seen.) The pictures were by Hasegawa Mitsunobu, described as a contemporary and doubtless a friend of the famous caricaturist Shunboku and "possibly the willing scapegoat whom that artist chose to bear the responsibility for his caricatures." Mitsunobu himself is said to have published three volumes of caricatures in 1724, and no one will doubt that he did so after seeing how he poked fun at the author of the Famous Products in his drawings of monstrous crabs, turnips and burdock roots. The author, Hirase Tetsusai said of the turnips that the "kabura" of Ōmi Province were so much larger than those produced anywhere else that only five or six could be carried in one load. As is evident from the amusing picture (Exhibit No. 73) the waggish artist had to have his little joke at the expense of the enthusiastic author. As for the burdock roots of Iyo, those were three or four shaku (up to six feet) long, our naturalist said, and too big to be pulled — they had to be dug. Our artist has a stalwart carrier loaded down with four medium roots, and two young people together struggling away from the garden with one really big root. Another amusing picture shows a giant crab as large as the two fishermen together scuttling away from their net with the outline of a broadly grinning face on his back, formed by the grooves of his carapace. It forecasts the industry in canned crabmeat for export that was to develop in Japan a couple of centuries later.

Another of the group of books on "products of land and sea" is so far industrial in content as to have only minor bearing on natural history. It is the Illustrated review of remarkable products of land and sea (1799) by Kimura Kōkyo (Exhibit No. 74). The first volume tells about the making of sake, the rice wine of Japan, the second concerns ores and other products of the earth (including fungi!), the third and fourth deal with fisheries, and the fifth is miscellaneous, but ends by describing foreign trade at Nagasaki with the Dutch and the Chinese.

Certain books on natural products merge with those on agriculture and special plant industries. Others fall more logically under natural history. There is mention in bibliographies of various other works in this classification that are represented in Western collections and some of them may have been disseminated only by manuscript copies.

GEOGRAPHY OF FOREIGN LANDS AND OF JAPAN

The Japanese were always interested in foreign lands and loved books of geographic description, in which fact and fable regarding the outside world were quaintly scrambled. Some of the books were quite frankly stories with a foreign setting which gave some idea of conditions and peoples in distant places. Since most were hardly at all botanical they had to be resolutely neglected in making the present collection.

One book of stories of the outer world which is included (Exhibit No. 57) has mention of the sacred banyan tree of India and reproduces an old picture that appeared originally in works of the Belgian botanist Clusius. Another (Exhibit No. 58) is hardly botanical at all, but a characteristic example of its class of Japanese literature. The type of geographic literature that the English call topography had a very early rise in Japan, following the models set, by the Chinese provincial gazeteers. It is said that the forerunner in Japan of the whole class of books known as Meisho was the Izumo Fūdoki, written in 733. The origin of such works in Japan, according to Aston (2) came about when early in the eighth century the Japanese Government gave orders for the compiling of geographical descriptions of all the provinces. The mineral, vegetable, and animal productions were to be noted, with the quality of the soil, the origin of the names of places, and local traditions."

Brown (12, p. 34) states that between 1650 and 1700 there were over fifty different meisho-ki published, nearly all profusely illustrated. From descriptions of provinces they came to be guidebooks to particular places of note, such as Kyōto, Edo, and Kamakura, descriptions of the things to be seen along the Tōkaidō, the great road from Kyōto to Edo, and some have no botanical content. Others have sketches of famous trees, show interesting general aspects of vegetation, horticulture, and agriculture, although the botanical interest of these fascinating books is incidental and varies to the vanishing point. Later they were greatly multiplied in number, and in selecting examples the collector quite generally preferred those

dealing with Japan's growing interest in her northern island of Hokkaidō, in Karafuto, in the Kuriles, and even in Kamchatka.

We do show, however, a notable book (Exhibit 59) on Okinawa and the Ryūkyūs in general in which there is some account of the vegetation, and good pictures of some of the tropical plants, such as the coconut, in part copied from the pioneer flora of the Ryūkyūs which we have already mentioned as having been produced by the Wakayama Natural Product Bureau.

BOOKS OF EXPLORATION TO THE NORTHWARD, AND ON THE AINU

Siebold (78, 2, p. 249) wrote that in his time the Japanese knew their own country better than most Europeans knew their fatherlands. The dependencies and protectorates, however, were transitional to that outer world where they were forbidden to travel. So the northern islands (Karafuto, the Kuriles, and Ezo or Hokkaidō), the Ryūkyū (Loochoo) Islands to the southward, and Korea were the subjects of most of their travel literature. There was always, however, a lively interest in the world beyond their limits, and a considerable literature dealt with stories from old sources about China and "barbarian" countries. There was even a Japanese edition of a Chinese work on the tropical plants that prevailed mostly to the southward of China proper, from the region of Canton down through Indochina. There was avid interest in foreign "barbarians."

Siebold remarks that since the Japanese had an especial aptitude for drawing and painting, the travel reports might be illustrated with remarkable paintings in the form of rolls many feet long, giving a panoramic view of land and people. Siebold came into possession of one from Tami Hachirō who in 1807 had accompanied Takahashi "Jetsizen" [Echizen] no Kami to Ezo. He in turn had obtained it from a skillful painter who resided long at Matsumai, the seat of Japanese administration, and a center of Ainu life. In the present exhibition there is a pictured work on the Ainu (No. 62) in three rolls which is similar to that described by Siebold, and possibly by the same artist. It is entitled Ezo Kikan and is by the artist Nankei. The date is uncertain, but there was a work of the period 1798 to 1801 entitled Ezotō Kikan which almost exactly corresponds to the greater part of the content of these rolls. This appears from a work which appeared in 1899 and 1900, Ishikawa Kosai's Ezo Miyage (Exhibit No. 64), stated to be a revised edition of Ezotō Kikan. The printed book contains the Ainu

pictures from the rolls, somewhat simplified. The chief change is in the modified picture of the sacrificial bear surrounded by ceremonial objects, held in reverence before the sacrificial feast, showing numerous inau sticks (whittled willow sticks with attached shavings, used as offerings to the gods) at the back of the altar. In the artist's picture these carry the skulls of previous sacrificial bears, but in the book of 1899 the skulls are omitted. This late edition also omits some of the less distinctively Ainu materials of the three rolls of the old Ezo Kikan but has a good many supplementary pictures of the marine mammals, fish, and crustaceans of the North. The rolls, however, contain parts on gathering marine products, fishing, and whaling, that are not in the printed work and may be of somewhat different date.

The Japanese explorer, Mamiya Rinzō, visited Sakhalin or Karafuto (his "North Ezo") and the opposite mainland coast ("Eastern Tartary") in 1807 and 1808. Von Siebold (78) had a copy of his narrative and published a German translation, or condensation, in his Nippon. In the renewal of interest in regions to the northward which followed Perry's visit and treaty, a version of Mamiya's North Ezo was published in 1855.
In the preface (dated Kaei 7th year, 1854) Suzuki Yoshinori states that even before Western foreigners investigated North Ezo, identified with "old Karafuto," and therefore Sakhalin, Mr. Mamiya, a government official, explored for two years not only that region but even the region of the Amur, in Manchuria. His investigations covered the material culture of the natives of Sakalin and also their ceremonies and religion. The two tribes which he described were the "Rarokko" and the "Sumerenku" (Siebold calls them Orotsko and Smerenkur), both non-Ainu, although with some customs similar to those of the Ainu.

Explorer Mamiya was of course elderly when he narrated this version of the report which he had made officially decades before. His account was published in German by Siebold (77) apparently as a translation (without pictures) of an earlier work entitled Totatsu Kikō (Voyage to eastern Tartary). According to the German version Mamiya left the northernmost point of Ezo on 13 August 1808, and sailed up the west coast of Sakhalin. His men were terrified by threats of slavery if they travelled beyond a place called Rijonai. Detained there until the sea froze over, Mamiya occupied himself by a winter land journey southward. During the following summer he finally got across to "Tartary" (Totatsu) or Manchuria, made his observations and inquiries about Russian penetration along the coast of the mainland southward from Siberia, returned to Sakhalin, and by the end of October was back in Ezo.

Mamiya found that on the east coast of Tartary near Taraika in the "Bogt Patientie" of the Dutch version there stood a boundary pillar, erected by the Manchu, with an inscription on it, but so weathered that he was unable to make it out. He was told that the Russians ordinarily came down the coast from the direction of Kamchatka.

The next work of the exhibition on exploration in the north may be the manuscript of Fujii Tashirō (Exhibit No. 65).

Immediately following the Perry Expedition there was much activity by the Japanese in Hokkaidō and Sakhalin, and we are able to exhibit several of the books that appeared as a result of it. All are by or edited by Matsuura Takeshirō.

THE INTERPRETATION OF ANCIENT PLANT LORE AND OF PLANT NAMES IN LITERATURE

From the beginning of contact of the Japanese with Chinese and Korean science and learning, which, according to Japanese tradition was at least as early as 285 A.D. there was a steady trend toward the adoption of foreign ideas and, of course, a steady suppression or replacement of indigenous lore. Since the oldest Japanese literature had to be written in Chinese characters it is clear that even from early times only comparative study of the literatures and folk lore of each country would indicate what was purely Japanese in plant lore and what may have taken on a Chinese or Korean tincture. The most authentic body of primitive Japanese tradition and lore is the Kojiki, Record of Ancient Matters, compiled by Ōno Yasumaro, about 712. Much antiquarian research has been devoted to determining the identity of plants mentioned in the Kojiki, in much the same spirit that the Christian West has built up an extensive literature in the attempt to interpret the plant names in the Bible. Shirai, the historian of Japanese botany, wrote on the subject, and considered the Kojiki as the first work on Japanese botany. He tells us that in it "several scores of plant names are mentioned by Chinese idiographs. This is the first document which shows the efforts of the comparative study of Chinese and Japanese plants. In 701 in the reign of the Emperor Mommu, a school of higher learning was erected in Nara, then the capital of Japan." At the same time a botanic garden of medicinal plants was established to which two professors and six students were attached. This is presumed to have been the beginning of formal or academic botanical teaching and research in Japan, so far as there is record, but it had

been preceded by a hundred and fifty years of the bringing in and study of Chinese and Korean books. In 554, Shirai tells us, a Chinese professor of medicine whose Japanese name was Oyuda came to Japan, and also two Korean explorers for drugs, named Hanryōhō and Teiyūda, "who contributed much to the advancement of medicine and the knowledge of drugs." Then in 562 came the learned Chisu of the Chinese Kingdom of Wu, bringing Chinese books which afforded great aid in the study of materia medica.

As an example of the sort of names in ancient literature that needed interpretation we quote certain passages from Brinkley (10), containing old plant names as interpreted by modern botanists:

"References to ceremonial uses of plants are found in the literature of Japan of the legendary period. An example is the appointment of two Kami to procure from Mount Kagu a "five-hundred-branched sakaki tree" (Cleyera japonica) from which various ritual objects were suspended, including paper-mulberry cloth (p. 12).

"Susanoo [Susanō, brother of the Sun-goddess and one of the Kami or ancestral founders] visiting the plain of high heaven, asked something to eat from the Kami of food. Offered bodily filth, he slew the Kami, and from her corpse sprang rice, millet, small and large beans, and barley. His sword, found in the tail of a fabulous mighty eight-headed serpent, was known as the "herb-queller" and subsequently belonged to the warrior Yamato-dake, hero of wars waged against the Kumaso to the southward and the Ainu, who then extended down to the middle of the main island. The Yamato were the main ancestors of the Japanese" (p. 13).

A son of Susanō, brother of the Sun-goddess and one of the Kami or ancestral founders under the name of Iso-Takeru, "is recorded to have brought with him from the high plain of heaven a quantity of seeds of trees and shrubs, which he planted, not in Korea, but in Tsukushi (Kyūshū) and the eight islands of Japan" (p. 14).

"Cotton was introduced in 799 by seeds carried on a ship that drifted from India to the coast of Mikawa. Fifteen years later tea plants were brought from overseas" (p. 280).

So the rise of botany in Japan was largely by bodily transplantation from China directly or by way of Korea. Nevertheless, purely Japanese plant lore persisted in other literature aside from medical, and lived on in popular tradition, but every old record of Japanese plant lore had to be written in Chinese, which required identification of Japanese plants with those of Chinese literature.

Shirai (71) has published (in Japanese) a most interesting Chronology of Japanese Botany, of which a greatly expanded edition appeared in 1943. One may glean from it that aside from incidental mention of plants in Japanese literature from the time of the Kojiki until 1600 there was little record of Japanese Botany except in the special field of materia medica. Formal study in all fields of learning had its beginning with Chinese literature, which had already attained maturity if not hoary antiquity. Plant names in the old Chinese poetry, which became popular and was imitated in Japan, afforded endless material for literary speculation and commentary.

In the latter half of the eighth century, there appeared the Manyōshū, a collection of some 4,500 poems. Plants mentioned in the Manyōshū have been the subject of later works, including a recent "Manyō Flora" by Koshimizu (40). Such works are written in much the same spirit as the works that have been written in English on the plants of Shakespeare.

In time there arose indigenous poetry in Japan which took its inspiration from nature and things of nature. Each poem was about some definite scene or tree or herb or animal which could be illustrated. So there also came to be various books illustrating flowers the object of which was to show what had inspired the poem. An example is the beautiful Adonis flower book (Exhibit 78).

A poet and artist who preferred to paint subjects of natural history was Katsuma Ryūsui, but his works are scarce and not available for our exhibition. He was a well-known composer of the 17-syllable poems called haiku. In his Umi-no-Sachi (Riches of the Sea) and Yama-no-Sachi (Riches of the Mountains) he illustrated molluscs, crustaceans, turtles and other creatures of the sea in two volumes (1762) and flowers and insects in two volumes (1765).

THE KACHŌ TRADITION IN JAPANESE ART

In Japanese bibliography kachō (pronounced and often spelled kwachō) signifies a book or collection of prints illustrating plants and birds together. The tradition of painting the "flowers of the four seasons" in combination with birds goes back beyond Japanese art to that of China. In China, however, there never arose so much popular demand for illustrated books that great artists turned their attention to the production of drawings and paintings specifically for woodcut reproduction, either black,

tinted, or in full color. Well illustrated old Chinese books are therefore rare, although they exist, whereas in Japan there were thousands of volumes before the era of woodcut books had passed. So, in the earliest Japanese books of natural history, following or copying Chinese originals, the illustrations are crude, as they mostly continued to be in Chinese books, whereas in Japan the impetus of a popular art ukiyo-e, largely directed toward book illustration, improved scientific books as it did those of every other branch of literature. Since from the early times of Japanese book illustration there were kachō, it was inevitable that those artists whose motives were wholly artistic should influence those whose motives were botanical. The artistic and the scientific objectives could not remain wholly apart when the number of artists working for the wood-block publishers was limited, when many artists of the popular school tended to become acutely naturalistic in their work and cultivated independent powers of observation; likewise, it should be stated, when the very same artists who followed the kachō tradition made pictures for the books of natural history, and the same readers bought both kinds of books, the scientific and the aesthetic.

It is useless to try to make any clear distinction between the flower and bird prints of the popular or "ukiyo-e" movement and others, for complete difference of style did not necessarily exist. The old schools of painting conceived of only certain traditional subjects as worthy of artistic treatment, and so long as wood-engraving merely reproduced conventional subjects there was nothing about it that marked any great departure in art. The real departure came with the minute observation and utilization of incidents of everyday life as less conventional and fresh subject matter. As for flowers and birds, they belonged to the subject matter of classical art tradition, and in the rendering of them there could be any degree of intergradation between the utmost fidelity to nature of the illustrator and his tendency to formalize or invent. In both China and Japan, however, the best artists held to the conception of fidelity to nature, however much of their conceptions might be etherialized. However devoid of detail the most impressionistic flower painting might be, whatever remained was likely to be true to nature. The classical art had not been afflicted with insanity when the popular art took over, even though mere copyists might have brought about some degeneration. Classical art had passed over wrestlers, acrobats, popular actors and the meaner aspects of daily life. Ukiyo-e art took them up, but did not abandon the older conventional subjects either. So it is quite useless to try to make any fine distinction between classical and ukiyo-e renderings of plants. Both ranged from the crudest gawkiest illustration to the most graceful and artistic, and both ranged from utter realism to

purely decorative design and symbolism. So far as ukiyo-e art in depicting plants is concerned, it would be merely the representation of plants by artists who dealt in the ukiyo-e manner with other and nontraditional subjects.

It is not correct, therefore, even if customary, to consider the wood-cut book illustrations of Japan as all belonging to ukiyo-e art. It was, however, the popularity and cheapness of ukiyo-e that led to a wide market for books and so botanical publication profited as much as all other book-making from the exuberant popularization of art. It is amazing what a quantity of books Japan produced after ukiyo-e came in. The latter, in some of its manifestations may have lost dignity and charm, as many critics have said, becoming offensively grotesque and exaggerated. As for wood-cut botanical illustration, however, it is impossible to say that it fell into any decline in quality. It was merely replaced by more modern methods which gradually replaced it after the restoration of 1868, which is commonly given as the date after which it is an article of faith with some collectors that Japanese prints were all bad. The writers believe that critics are inconsistent who complain, almost in the same breath, that wood-cut printing then suddenly became hopelessly bad, but that one cannot too carefully scrutinize reprints made in the late period because they deceive even experts! Why, if they deceive experts, are they not good? There are excellent modern reproductions of some of the old floral illustrations that should be highly prized by anyone lucky enough to have them.

The art of wood-block printing in color was long ago pronounced by several European and American critics to have died at least by 1889 if not as early as 1858. Fortunately, however, the Japanese bird and flower artists and their publishers did not know it, and continued to produce kachō as good as any by older masters that the critics approved. It is of course true that the indiscriminate use of aniline dyes (especially violet) resulted in much crudely printed work, but the publishers of kachō realized the danger to the craft and continued to use traditional pigments. So some good artisanship in that field actually survived while modern Western methods of illustration gained ground, for they were destined to replace wood-cut printing quite regardless of whether the latter was technically good or not. Some of the kachō produced down to about 1925 were as beautiful and showed as excellent artisanship as those of a century earlier. Those who hold reprints in disdain may have to study a single print diligently to decide whether it is an original and a treasure or a worthless facsimile, which seems to indicate lack of appreciation of the wood-cut art for its own sake, regardless of cost or rarity.

During the period of rapid westernization, artistic plant illustration perhaps adhered more closely to tradition than did scientific. At any rate we have extended the time limit for our display of kachō, and art books displaying plants only, down to about 1917. In some of the later works depicting birds and flowers the emphasis was almost entirely on the birds to the disregard of the plants, so that the latter form only a more or less impressionistic setting or background.

If one were to attempt to classify the kachō and the less scientific flower books as belonging to various schools of art other than ukiyo-e, one of the earlier color-printed items of the collection (Exhibit No. 53) would best represent the Chinese school. The artist who produced it was Kitao Keisai Masayoshi (ca. 1761-1824) whose early work was similar to that of his master Shigemasa in the ukiyo-e or naturalistic manner. Later he was influenced by the Chinese school of artists that flourished at Kyōto. His first impressionistic work appeared as Drawings of birds and flowers in the Chinese manner in 1789. Books of his which are shown (Exhibits 53 and 102) include the Selection of sketches of 1813, consisting of drawings of flowers without outline. Some of the very pale colors have faded greatly in the course of years, but the book remains of great interest. Perhaps 50 years ago Bertha Lockwood (a friend of Miss Roda Selleck and herself the other one of the two Indianapolis devotees of Japanese art) attempted to reproduce some of Masayoshi's flower prints by wood-block printing, and issued ten prints on paper imported from Japan, with a single page of text, the latter on poor wood-pulp paper of the worst period of paper-making. All ten prints differ considerably in color from the originals, but it must be remembered that the printers varied their colors from time to time. Collectors all know the tremendous differences that exist among authentic prints of Hiroshige of different printings. The collector is indebted to Mrs. Roda Selleck Pollock for the gift of one of her two sets of the Lockwood reproductions, and to Mrs. Grace L. Kuehnle for an interesting letter about them.

The impressionistic school of painters at Kyōto was founded by Ganku Utanosuke (1748-1838) who was at first a painter of flowers and birds. He was a follower of the Chinese master Chin Nampin who established a studio in Nagasaki about 1730. Ganku's pupil Kawamura Bumpō of Kyōto was a great illustrator, active from 1800 to 1824, and his books, are said by Brown (12, p. 103) to be "among the most delightful and typical examples of the work done

by the men of the Kyōto schools." The very rare Kimpayen Gafu (Exhibit no. 94), published in 1820, is stylistically unusual in that the pictures are printed in pale hues, and frequently but not invariably without outlines. Brown described it as resembling the Ryakuga-shiki by Kitao Masayoshi Keisai, (Exhibit No. 102) published seven years earlier, "which, although a much more famous book than the Kimpayen Gafu, is no more delightful." Bumpō employed a technique for representing the veins of leaves without printing them against the general green of the leaf blade with another block. Instead, he employed only a single block for printing the green of each leaf surface, and brought out the veins by leaving a narrow white space on each side. This method he used very skillfully, and his employment of it was a great improvement over the flat coloring of many plant paintings of the Kano school. The different hues of the upper and lower sides of the leaf however, required the use of two blocks for green and his contrasting of the two in the design was effectively handled.

FLOWERS OF THE FOUR SEASONS

Closely related to the kachō and grouped with them are works illustrating plants only, but from an aesthetic standpoint, without descriptive text (Exhibits No. 81 to No. 84); likewise works picturing the birds of conventional art only, without flowers, or showing plants in a merely subsidiary and undetailed manner, as an impressionistic setting or background (Exhibit No. 91). Here fall the works showing the traditional "Flowers of the Four Seasons" (Exhibit No. 103), which often include birds.

We have thrown with the kachō those collections of miscellaneous artists sketches containing a considerable proportion of bird and flower pictures as a group, if the object of the work was aesthetic rather than scientific or instructional.

Like the kachō, the traditional studies of flowers alone or birds alone had their inspiration from Chinese art. There are many old Chinese paintings on silk, backed with paper or cloth, or with both, and sometimes preserved as rolls many feet long. Except that these were seldom or never intended to be reproduced as prints, these corresponded exactly with similar Japanese works of art, but the latter were often originally intended for publication by wood-block printing or were likely to be so reproduced sooner or later by devoted pupils, or admirers, or mere plagiarists.

It has to be confessed that artistic flower studies merge into works on landscape and garden design. Landscape as such is meagerly represented in our exhibition, for lack of material except single prints, such as those of Hokusai and Hiroshige, which are more familiar to most persons than Japanese books, and which have been exhibited frequently in Ann Arbor, including a few from the senior author's collection.

THE JAPANESE ART OF FLOWER ARRANGEMENT

In 1954 a celebration was sponsored by the Museum of Art of the University of Michigan in commemoration of the hundredth anniversary of the sending of the Perry Expedition to Japan. One of the public lectures on that occasion, by Mrs. Mary Cokely Wood (94), published in the Asa Gray Bulletin, dealt with the "History and Philosophy of the Flower Arrangement Art of Japan." Mrs. Wood's book on the subject of ikebana (93) has been published in Tōkyō. Her collection of ancient and rare Japanese books was drawn upon to illustrate her lecture. It seems needless here to go into detail about matters which she has already so fully presented to our readers. It is enough to say that the art of flower arrangement was originally highly formal and symbolic, even ritualistic, and that even today plant materials are avoided which traditionally have been considered useless or of ill omen in connection with it. The art of ikebana goes farther back than the printed books about it. There was a printed edition of one book in 1643 that went back, possibly only in manuscript copies, at least to 1445. Other early books on ikebana in Mrs. Wood's collection date from 1681, 1684, 1688, 1696, 1790, and 1798. With later ones, also rare and interesting, they are referred to in her book. The three that we exhibit happen not to be included among the illustrative materials for her lecture, and the lack of duplication only goes to illustrate that the literature of ikebana is not only extensive, but that the historically important items are by no means easily obtained.

LANDSCAPES AND VIEWS OF FAMOUS PLACES

Early books on famous places with black illustrations eventually gave way largely to colored picture books which were immensely popular. Some were without text, and some were collections of single sheets, although often belonging to a numbered series, and the more famous ones are seldom seen in complete sets. If the single

sheets were issued at intervals it is probable that very few complete sets of some were ever assembled when they were current. Some sets are unknown in complete condition and may never have been finished, but others were issued in book form in sufficient numbers so that they are fairly frequent. One of the lesser works of Hiroshige is shown (Exhibit No. 85).

Sets of landscape pictures, with only a title by way of text, or even lacking that, sometimes followed old conventions of certain paintings that were intended to correspond in subject matter with a group of poems. Sets of eight, for instance, depicted the same idyllic place in a manner appropriate for eight different traditional titles. Whatever the place was (generally Lake Biwa) the titles would be the same, namely, Snow, Evening Rain, Autumn Moon, Evening Bells, Home-coming Boats at End of Day, Geese in homeward Flight, Sunset, and Clearing-up after Rain. These same titles were, of course, used for Edo, or any other scenic place. An easy variant was to do eight scenes at a place, but not to follow the poetic pattern, or eight waterfalls anywhere, or eight bridges. Hiroshige's favorite subject in landscape was the Tōkaidō, the famous post road from Kyōto to Edo, and there are several series of the 53 stations. Hokusai's most famous prints were the 36 views of famous Fujiyama shown in every aspect in every season. Another favorite series which was completed by Hiroshige consisted of one view of each of the six rivers named "Tama." The Japanese particularly enjoyed pictures that recalled the scenes of a trip or a pilgrimage, and served as a memento. The landscape art of the Japanese print artists has appealed more generally to Americans than any other phase of their work. There is hardly a naturalist or geographer who is not more or less interested in landscape, natural and as modified by man, but the single prints of the chief artists are so well known and so frequently exhibited that they are not included in our exhibition.

Most of the same artists who made single prints also illustrated books. Their pictures were then engraved in two parts if they were to cover two pages. The left and right sides were printed from different sets of blocks. This enabled the book to be sewn into a regular volume without any of the divided picture being sewn into the back, for the inner margins of the pages were unprinted. Book illustrations originally printed in halves were sometimes removed, trimmed, and very cleverly mounted side by side with no gap between the halves. This has been done with a bound set of book illustrations which we show in this exhibition. These have been trimmed, mounted, and made into a volume of accordion format, to the great detriment of the prints from a collector's standpoint, for the precious margins should never have been cropped off. Pictures engraved on separate

left and right blocks seldom fitted exactly, and so are instantly detected, even without looking for the line of contact of the abutting mounted sheets of such a remade volume as we exhibit. Likewise the inking of the different colors could rarely be indistinguishably the same on the two halves.

A curious little volume that we show, although not in original state, is unusually interesting for the map of Mount Fuji. It is a circular panorama, the aspect from every direction being what would be seen looking from the periphery directly toward the crater. This map should be compared with another peculiar panorama, a double one, to be seen at right angles to a transverse axis as the observer travelled along a river, rather than viewed radially toward the top of a mountain, as the observer travelled all the way around it.

The volume of maps and views that we refer to (Exhibit 58) is by Kikugawa Yeizan (1787-1867). He imitated Utamaro's style in portraying heads of beautiful women and actors so successfully that when he signed Utamaro's name even experts could not tell the difference. He also imitated Hokusai in landscape, and Kunisada in full length figures of women. His later prints were elaborate but of little originality. Stewart (80) states that "he ceased designing colour-prints about 1829, after which he turned his attention to literature and the illustrating of books. . ." He was the teacher of Eisen Keisai, a contemporary and collaborator of Hiroshige.

GARDENS AS FAMOUS PLACES: THE GARDENS OF KYŌTO

Garden art is very ancient in Japan, and one would expect a more abundant and specialized pre-Meiji literature on it than seems to exist. Most of the descriptions and pictures of gardens in the Edo period are probably to be found scattered through the numerous books on famous places. One definitely on gardens, of the late Edo period, turned up in the course of making the present collection. We have not seen any edition of an ancient work, the Sakutei-ki (Memoranda for Garden Making) dating from about 1200 A. D. which, as Tamura (84) remarks, is certainly one of the oldest books in the world on landscape art. Neither have we found a work entitled Tsukiyama Teizōden (Record of Building Gardens) upon which the only garden book we are able to display was based. (See Exhibit No. 107). The latter, Akizato Ridō's Illustrations of Famous Places, is one of the most interesting in the exhibition, however, showing as it does, many of the most admired garden scenes of

Kyōto at the close of the 18th century. The author tells us that he found a dearth of poems about gardens (rinsen) to accompany his text and pictures, so, to have enough, he suggested that various famous people of Kyōto should write some to go with his own. He took unusual care about preserving the identity of the artists who illustrated his five (actually six) volumes so copiously, and so each of the three artists signed his own pictures. These volumes of Kyōto scenes are a delightful record of the gardens of the capital toward the end of the Edo period. Our author said that not all of the scenes would necessarily show gardens. Nearly all, however, have some relation to garden craft, for they include pictures of flower-viewing picnics when the cherries were in bloom, of flower-arrangement parties, of tea-ceremonies of the "tea-men" (cha-jin), of boating parties and pleasure boats, of markets where flowers and plants were sold, of rock arrangement "gardens," of processions, festivals and fairs, and of unarranged, beautiful accidental groupings of trees with water. At the time the prevailing styles in gardening emphasized the use of picturesque rocks and stone lanterns, of a pond with an island and bridges, or (nearly always) with carefully arranged stepping stones and, at Kyōto, running water. The artists had been instructed to show the size of trees and extent of water in each picture by drawing the people to proper scale.

MODEL SKETCHES FOR THE USE OF ART STUDENTS AND OTHERS

Hardly any books are more likely to turn up in Japanese collections than books of designs and sketches that were intended to be used as models by art students. Many such representing their own work were produced by the original artists themselves or by copyists who based their pictures upon work of their own teachers, or upon paintings by famous older Japanese artists or still more ancient Chinese. The pupils of the more popular artists seemed to demand such instruction books from their masters. The model sketches best known in Europe and America are in the 15-volume series by Hokusai, entitled Manga. This famous work has been reviled by some critics as contemptible and praised to the skies by others. Regarding its origin we find in the introduction to volume I, as translated by F. Victor Dickins (20), the following explanation by his friend "Honshu Keijin of Biroka in Bishu":
"During this autumn the master chanced to come westward, and stopped under my roof, and came to know Bokusen of Gekko-tei, to the great delight of both, and over three hundred compositions were the result of their meeting.

"From [portraying] pious recluses and Buddhist saints, from men and women of position, to beasts and birds, and flowers and trees, nothing in Nature was unattempted — his brush limned the spirit of all things. . . .

"What can be said more? The volume is a very model for art students.

"As to the title "Mangwa", it was chosen by the master himself,

"The tenth month of Mizo-no-e, Saru (Monkey) year of Bunkwa (December 1812)."

Dickins goes on to say: "Perhaps as good an equivalent as any for the title Mangwa would be Liber Studiorum, for it is in truth a collection or selection of 'studies', completed for publication, and arranged to some extent according to subjects. I cannot myself help thinking they were as much intended for instruction as for amusement, and were, no doubt, often resorted to by Hokusai himself and his pupils in connection with later productions."

East (25) rendered the title Manga as "rough or rapid sketches." Each of the first ten volumes of the Manga, as well as the last, has a preface by one of Hokusai's friends, from which certain extracts are helpful for an understanding of the work. These follow, all as translated by Dickens.

(From Vol. IV.) "His pupils being distressed over the want of sketches by the master, Hokusai took pity on them, and when he could find time drew landscapes, scenes from human life, animals, and even household objects of all kinds in continuous succession, which he caused to be copied and engraved on wood, and so produced a ladder for those who were beginning their art careers, collecting all the sketches thus into volumes. . . On a careful comparison of the present with the last volume, it will be seen that the sketches in the latter are finely drawn, like the strokes of square characters, but now we have a series of drawings distinguished by the rapidity and vigour of their execution. Pictures may be classified as gwa (rapid sketches), zu (pictures), and utsushi (faithful copies of objects). The third volume contains zu and utsushi, the fourth gwa. . . To guide the master's pupils in the right way would be no small merit, the merit of a true teacher, and it is in the hope of working to that end that this preface has been written". - Hōzān gyo-ō shiki (the sage old angler of Mt. Hō).

(From Vol. V.) "The fertility of the master's brush is inexhaustible, the niceness of his touch so great that bloom and blossom of tree and herb almost acknowledge as rivals the faithful portrayals of their beauties. . ." Rokujuyen.

(From Vol. VII.) ". . . through the mists that cling to Miho's shore, I discern the far-famed Pine of Sumino'é and wonder how many ages hath affronted the deathless tree. Anon I stand tremblingly on Kameji's high bridge, or marvel at the great Akita fuki (Nardosmia) and consider with awe the immeasurable grandeur of nature, flowers, and tinted woods, and moonlight, and dazzling snow, and the beauties of spring and autumn; how can I find words here to describe the joy and delight they cause?. . ."

(From Vol. VIII.) "Then pupils flocked to his studio desirous of instruction, but the master said, 'There is no teaching of Art; one has but to follow Nature closely to become an artist, as it were, of oneself'. The students were not satisfied with this doctrine, and remonstrance was made. 'The master has founded the Katsushika school', it was said, 'and there are many who would fain follow in his footsteps and approach his excellence, but how can one do this with the aid of any other teacher than himself?. . .' The master took this view and produced a number of sketches. . . as he found leisure, which were collected into volumes for the use of his pupils. To this, the eighth of the series, I have been asked to write a preface, but as I know nothing of art, I have simply related the way in which these Mangwa volumes have come into existence." By Hōzan.

(From Vol. XV.) "The works of the Mangwa series being in the possession of my family, I have thought it well to supplement the work and fulfill the author's intentions by adding this fifteenth volume of various sketches. I have been moved thereto, also, by coming across a foreign book containing some of Hokusai's work, so that I have understood how widely extended was his fame. . . . By good hap I came across a number of unpublished sketches in an old box, many of which are included in this volume. . . ." Katano Tōjirō, 7th month, 11 Meiji (1878).

Dickins tells us how in 1863 he picked up at Nagasaki an odd volume (the ninth) of Hokusai's Manga. "I well remember," he wrote "my delight in the volume — one of the best among the fifteen. . ." The collector of the books in the present exhibition was too inexperienced in 1918 to realize that one was very lucky to find even an odd volume or two of the Manga, and did not properly prize the three or four that he picked up at the ports of call of the "Empress of Russia," Yokahama, Kōbe, and Nagasaki, on his first trip to the Orient. All these he gave away, assuming

that a full set would eventually turn up, but it never did. So the collection contains only a recently acquired modern reprint (Exhibit 89).

The sadly inexperienced collector of 1918 should have run across some warning like the later one of Brown, who, before 1924, gathered ehon, picture-books, most industriously during several years in Japan, but her experience was still in the future. She said: "A complete set of the original edition of the Manga in good order can now hardly be obtained. By virtue of patience and continued search, however, one may sometimes form a full set by finding single volumes here and there and uniting them; a set thus collected engendering a greater affection, perhaps, in the heart of the collector than one found complete in a curio shop."

Another odd volume of the same general type, by Japan's other great landscape artist, Hiroshige, is shown in the original edition. (Exhibit 85).

If it be asked why such artists' sketches for artists are of any interest in connection with the history of botany and zoology, the answer, of course, is that from the time of Moronobu on, the leading artists who made paintings for woodblock reproduction delighted in doing a volume or more of birds and flowers or of flowers of the four seasons, which set the standard toward which the less talented artists would all strive. Without the ukiyo-e art, the depicting of the passing world, it is safe to say that botanical and zoological illustrating would have remained in a rudimentary state.

ARTISTS' AND NATURALISTS' NOTEBOOKS

Allied to such works as the Manga of Hokusai there were of course many artists' and naturalists' notebooks that never came to publication. Such turn up occasionally, and may be quite unidentifiable. Some manuscripts may be the copies made by a learner. Others may obviously have been done by a mature and talented artist, as an excellent naturalist might be. About acquiring such things a collector has to make up his mind about whether he likes them or not, and act accordingly, hoping, of course, that they may sometime be identified. Of many manuscripts containing drawings there may have been several or many copies, and copies made from an already printed work, no matter how skillfully, can hardly be as desirable as the older printed edition. Rarities were often copied by hand in Japan, as also in China. Interesting sketches by unidentified artists

in the present collection are Exhibits 81 and 82.Only those have been acquired which might have been studies for some published or unpublished work on plants or animals.

There is also shown a modern manuscript by one of the best known botanists of the group who made the transition from the old to the new in the early decades following the Restoration. Tanaka Yoshio was one of the two who edited the second edition of the famous flora of Iinuma Yokusai (Exhibit 29) for publication. Then he wrote a pioneer work on the economic botany of Japan (Exhibit 28). Various articles and books followed until as late as 1897. What may have been his last work was a study of the varieties and forms of Adonis amurensis done in 1900. The manuscript is beautifully written and illustrated by dainty water-color paintings. We have not yet found that it was ever published. It is a beautiful memento of the life and work of one of the foremost of Japan's Meiji naturalists.

Adonis amurensis may be potted and brought indoors in midwinter, when it will promptly flower. It has long been popular in Japan as one of the earliest and most charming flowers of early Spring. The finest early picture book of flowers and poems (Exhibit 78) was the Adonis Flower Book, but there seems to have been no special Japanese literature of Adonis until Tanaka Yoshio made his study, which is botanically as well as horticulturally of unusual interest, and should be published if it has not been.

TEXTBOOKS

Textbooks, especially translations from Dutch and other European languages, played a great part in the westernization of Japanese science. They seem to have been especially numerous in the pre-Meiji literature of medicine. They may or may not be regarded as worthy of a place in a library, depending upon whether one looks upon them as documentary evidence of a great trend in the cultural history of a great nation or as contributions to knowledge. From the former standpoint they are of the greatest significance: from the latter they are negligible. An otherwise undistinguished textbook, one that in the literature of its own language might well have suffered the fate of most textbooks, to be forgotten with no regret by anyone, if translated into Japanese might have had an important part in modernizing the thought or science of the Orient.

In botany there were not many early textbooks. Most of them were to follow the Restoration. The most important, according to Shirai's essay of 1926, were a treatise on natural objects, translated from the Dutch by Ōtsuki Gentaku (1817), and a famous textbook of 1833 by Udagawa Yoan (Exhibit 111). Later, to quote Shirai "Commander Perry came to Uraga, and in 1859 five ports of Japan were opened to Western nations and the flow of Western civilization pouring into the bosom of the awakened nation suddenly increased." In 1857 a bureau called the Bansho Shirabe-jo was established in Yedo [Edo, later Tōkyō] in which researches in Western learning were intended to be carried on. This bureau was the origin of the Tōkyō Imperial University of the present day. In this bureau Itō Keisuke and Tanaka Yoshio worked as representatives of the Natural History Investigation Section.

Now we pass to the modern period which begins about 1868. The first botanist who appeared in this period is Yatabe Ryōkichi. He studied botany in Cornell University in the United States of America and returned to Japan in 1877, and became Professor of Botany in the Tōkyō Imperial University. It was he who educated most of the Japanese botanists of the present century. We also show (Exhibit 112) the first important botanical textbook of the Meiji period.

PART II

Catalogue of an Exhibition of Japanese Books and Manuscripts, mostly Botanical, Held at the Clements Library of the University of Michigan, in Commemoration of the Hundreth Anniversary (1954) of the First Treaty between the United States and Japan.

The record of each exhibit in the following Catalogue consists of three items, (a) a Romanized bibliographic entry, (b) a characteristic illustration, and (c) a legend for the illustration. Since the titles of Japanese books are not always Romanized exactly alike by all bibliographers, Dr. Su-Ying Liu has kindly copied the Kanji titles, and these are uniformly inserted just above the accompanying illustrations. (Of course book titles do not appear in this position in the original books.) Whenever spacing allowed, the illustrations have been inserted below the corresponding bibliographic entry, or in the following note, but in any event the figures are numbered to correspond with the numbers of the exhibits.

The classification of the exhibits follows the listing on pp. 293 and 346.

I. ENCYCLOPEDIAS AND RELATED WORKS
(Exhibits 1 to 4)

Exhibit 1. Nakamura Tekisai, Kimmō-zui (Pictures to teach children). 14 vols., i.e., 20 parts in 12 vols. index, 2 vols. n. p.: Kambun 6 (1666). Vol. I, parts 1-3, astronomy, geography, habitations; Vol. II, parts 4 & 5, classes of society, the human body; Vol. III, parts 6 & 7, clothing, valuables; Vols. IV, V, VI, parts 8-11, arts and crafts; Vol. VII, parts 12 & 13, mammals and birds; Vol. VIII, parts 14 & 15, fish and reptiles; Vol. IX, parts 16 & 17, rice and other cereals, vegetables; Vol. X, part 18, fruits and melons; Vol. XI, part 19, trees and bamboos; Vol. XII, part 20, flowering plants.

訓蒙圖彙

Fig. 1. Four pictures from the Kimmō-zui which do not belong together, but are regrouped to retain the quartered-page arrangement of this old Japanese children's encyclopaedia. Upper left; the Chinese and Japanese conception of a mythical shōjō, identified in modern dictionaries with the orang utan of Sumatra and Borneo, stories of which doubtless reached Japan via China in ancient times. Upper right; the legendary phoenix, "called hōō, the hō being the male and the ō the female." Lower left; Cycas revoluta, "tetushō (other names kaisō and hōbishō): the kind that comes from Ryūkyū is called banshō." This is doubtless one of the earliest Japanese records of the botany of the Ryūkyū ("Loochoo") Islands. Lower right; shuro, the hemp-palm, Trachycarpus excelsa, perhaps the northernmost Oriental palm.

Exhibit 2. Hirazumi Seian, Morokoshi Kimmō zui (Picture encyclopaedia of things Chinese, to instruct children). 15 vols. Ōsaka: (publishers, Hōbundō; Onigi Ichibei) and Edo (publisher. Suhara Mohei). Kyōho 4 (1719). Illustrated by Naramura Yūzei (Tachibana). Vol. I, astronomy; Vol. II, geography; Vol. III, the palace; Vols. IV and V, personalities; human and legendary begins; Vol. VI, sports and contests; Vol. VII, implements, ornaments, ceremonial objects; Vol. VIII, ships, vehicles, fishing gear, insignia, weapons; Vol. IX, weapons, utensils, furniture, machinery; XII, plants; Vol. XIII, birds and mammals; Vol. XIV, the dragon, fish, turtles, invertebrates; Vol. XV, index.

Vol. I has one picture to each half-leaf; Vol. II, one or two; Vol. III, one, two, or four; Vol. IV, four; Vol. V, mostly four; Vol. VI, one to four; Vol. VII, mostly six or four; Vols. VIII and IX, two to many; Vols. X, six or more; Vols. XI and XII, six; Vols. XIII and XIV, mostly four.

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Fig. 2. Two mythical creatures. Above is the shin, which was imagined as snake-like, but with horns like a dragon, and able to produce by blowing a mirage of a plain and a castle. Below it is the ōryū, the fabled winged dragon of Kyōkyu Mountain. Although the figures of this encyclopedia are extraordinarily crude (one of the turtles has six legs!) the natural history is not entirely unnatural. If tempted to feel superior, we should remember the unicorns, griffins, mermaids, and even dragons that long persisted in our own natural history! The plant illustrations are at least as good as those of Europe less than a century earlier, down to the time of Brunfels and Fuchs. We must also remember that at the date of this work Japan already had beginnings of indigenous natural history superior to our zoological selections from this old Encyclopedia, which was borrowed from China and was already antiquated there. In all countries well known comprehensive works remain current long after much that they contain has been discredited.

Exhibit No. 3. Nakada and Kawabe, Zōho Kashiragaki Kimmō zui Taisei (Supplementary illustrated book for children). 21 parts in 11 vols. Kyōto: (published by Kyūkōdō). Kansei 1 (1789).

Supplementary to Nakamura Tekisai, Kimmō zui, of 1666. The entire work is exhibited, but only as made up by combining two imperfect copies acquired at different times. The publisher's grouping of parts into volumes varied in making up sets. Some parts, therefore, are represented twice in the assembled complete set. The last part, maki XXI, seems to have been added by afterthought, for it is not included in the table of contents.

Contents: Vol. I, five separately paged prefaces and table of contents. Vol. II, 24 consecutively numbered leaves, part 1, astronomy and the sky; part 2, geography; part 3, buildings. Vol. III, part 4, occupations of men and mythical beings. Vol. IV, part 5, anatomy; part 6, ornaments and clothing; part 7, fossils, minerals, curiosities, textiles, etc.; part 8, paintings, other works of art, masks, musical instruments, games, toys. Vol. V, part 9, insignia, weapons, transportation; part 10, agricultural implements, craftsmen's tools, machines, fishing gear, rope, traps, ceramics, utensils; part 11, furniture, lacquer work, metal work. Vol. VI, part 12, mammals; part 13, birds. Vol. VII, dragons and all lower animals; part 16, cereals, hemp, legumes, poppy, sesame. Vol. VIII, part 16, (repeated: see note above); part 17, root crops, other vegetables, edible sea-weeds and fungi; part 18, fruits, nuts, sugarcane, hops, water-chestnut. Vol. IX, parts 17 and 18 (repeated: see note above); part 19, woody plants. Vol. X (mislabelled IX), part 20, herbs. Vol. XI (mislabelled X), part 21, celestial beings, legends, fine arts, sports, games, flower arrangement, dancing, music, drama, etc.

Fig. 3a. The Phoenix, from the Illustrated Book for children, 1789. On Account of Ann Arbor's current interest in this mythical bird, whose name is associated with its Phoenix Memorial Project, in honor of those who died in World War II, we show a Japanese conception of it from the beginning of Vol. 6, part 13. "The Phoenix is called the Bird of the Holy Spirit. The male is hō, the female ō. The body is like that of the domestic chicken; the feathers gay; the height four or five feet; the voice like the note of a flute. It does not eat living insects, does not step on the ground, likes the Paulownia tree, and eats the fruits of certain kinds of bamboos."

Fig. 3b. Another picture from the Illustrated Book for Children; the making of a flower arrangement in the style named for Rikka, steward of Rokkakudō of Kyōto, a master of the School of Ikenobō. Annually on the 7th of July he gathered his disciples and they enjoyed seeing his flower arrangement. "Recently another style," our author says, "has become popular, called nageire, literally "throwing" and there are many meetings for nageire arrangement. No wonder all people enjoy flowers, for they console the mind and dispell gloom." Our encyclopaedia does not picture the newer, more popular and less formal style of flower arrangement.

Exhibit 4. Ehon Shoshin Hashiradate, Jō; Chū (Picture book: a guide for beginners). 2 Vols., 2nd edition. Osaka: Shibukawa Seimon; Kyōto: Imai Kembei; Imai Shichirō. Kansei 6 (1797).

The short unsigned foreword and prologue (supposedly the same as in the earlier edition) state that the writer himself made the pictures for this work from the drawings of masters, and that he apologizes for this poor copying. Following these is the date of the original edition, Shōtoku 5 (1715). There is no text except the names of the animals and plants figured. This curious old book of natural history follows closely the tradition of the zoological and botanical sections of earlier picture encyclopaedias. It is said to have been first printed in 1715, and its early origin is clearly indicated by the portrayal of mythical creatures in Volume I. The first picture, entitled Shōjō (orangutan), symbolic of the wonders to follow, is in the nature of a pipe dream, reminiscent of the tale in the Arabian Nights representing genii emerging from a jar. The picture shows an elaborately clad and by no means drenched and dripping human figure with long and sparse hair like the old Japanese conception of an orangutan popping up in the air from the disturbed surface of what is apparently sake in a large jar. Two figures with astonished expressions (one with another dipper a yard long, and the other with a fan and a sake cup), much smaller than the immense jar, are viewing the apparition. This picture is followed by others representing other mythical and exotic animals, and one finds here prototypes of the pictures of elephants which appeared with some variations in later Japanese books and prints bearing Indian potentates on their backs. Dragons, turtles, crabs, fish and sea-shells follow the real and imaginary animals.

Volume II is a forerunner of the later kachō, illustrating birds and plants, but the latter is highly conventionalized pine, bamboo, cherry, etc., and intended only as a setting for the birds.

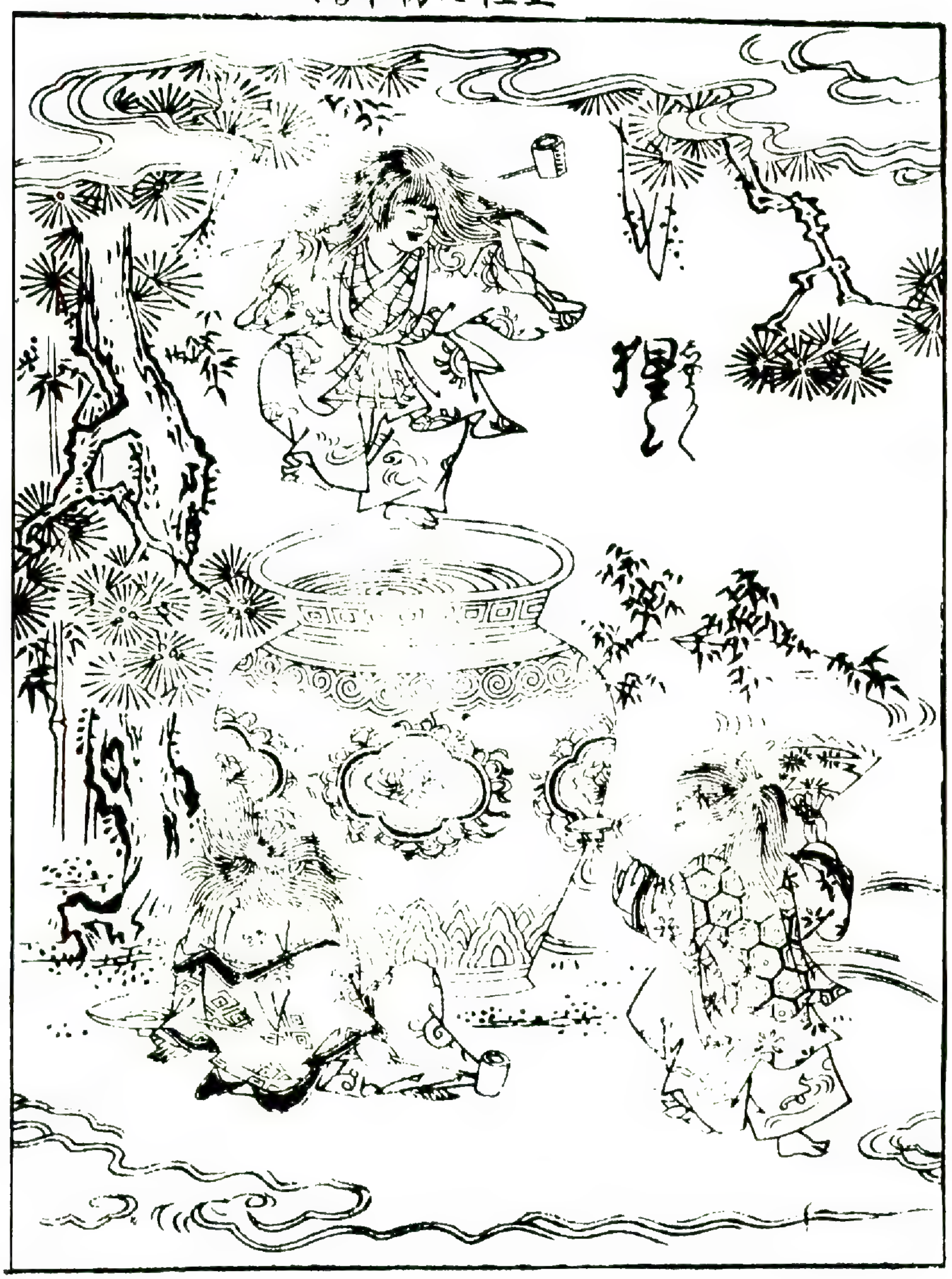


Fig. 4a. An apparition called forth by drinking sake.

Fig. 4b. A page of the book illustrating jakuro (pomegranate) above the i chō (gingkgo).

II. HERBALS AND RELATED WORKS OF NATURAL HISTORY WITH MORE OR LESS SPECIAL REFERENCE TO MATERIA MEDICA.
(Exhibits 5 to 9)

Exhibit 5. Ushiyama Kōgetsu, Yakurō Honzō (Japanese plants useful for medicine). 6 vols. Kyōto, Kyōho 19 (1734).

An unillustrated herbal which was highly esteemed and went through several editions; notable for the clarity of the classical Chinese characters, and actually all written in Chinese, (kanbun) without accessory Japanese characters.

Exhibit 6. Nin (or Jin) An'ō, Zōtei Honzō Biyō, Kan; Kon (Essential herbal, enlarged and revised, I; II). 2 vols. Kyoto: copyright, Sanseidō; bookstore, Kimura Kichiuemon, Kansei 5 (1793).

Shirai states that the first edition was published in Kyōho 3 (1728). Vol. I of the 1793 edition deals with 190 kinds of herbs; Vol. II with 81 woody plants, 22 grains, 17 vegetables, 5 metals, 37 stones, 5 earths, with water, 5 kinds of birds, 20 other animals, and 9 things pertaining to man. This work is chiefly concerned with medicinal properties of the things dealt with.

Exhibit 7. Ohara Tōdō (alias Yoshinao, or Genzaburō), Tōdō Ihitsu (Tōdō's posthumous works). 9 vols. Wakayama: publishers, Seireidō, Seidadō, Seijudō, Tempo 4 (1833). Edited by Ohara Rankei, Tōdō's grandson. Preface by Kondō Kōdō, Kishū Clan physician.

Described by de Rosny (Cat. No. 826) from the apparently incomplete Nordenskiöld copy as a botanical treatise in 5 vols. and by Merrill and Walker (47), apparently from the last three volumes only, as a botanical treatise in three books consisting of extracts from other authors, Chinese and Japanese, supplemented by the author's observations. The copy exhibited consists of three series of three volumes each, the first six of the consecutively numbered volumes consisting of alternating items of botany and zoology. The illustrations range from seals on snow-covered rocks to tropical figs, from snowy owls to a citrus fruit. Those of vols. IV -- VI are signed by artists' seals. Volumes VII -- IX are botanical.

Tōdō, according to Kondō Kōdō, the physician, had been interested in plants from childhood. He received instruction from Ono Ranzan, with whom he explored Nikkō and Kumano mountains and collected plants. Although his knowledge and writings were extensive, he was too modest to arrange for the publication of his works, and so it remained for his grandson Rankei to do so.

There is much curious zoological as well as botanical lore in the works of Tōdō. The two are combined in the account of the fungi which grow from the bodies of insects. These were called tōchūkasō, and were known from Japan as well as from foreign countries. Tōdō tells us that those from foreign countries are long, more than 1 shaku, and as big around as a writing brush; color dark blue. The "worm" itself is slightly yellowish and when dried up looks like coral. According to Mr. Hirokawa in his Record of Nagasaki, some Chinese merchants prized them as medicine for the kidneys. This tōsōkachū appears in old Chinese writings. According to Tōdō, in Japan it is found in various places in Honshū but never in sunny places. In Gōshū (Ōmi Province) it grows either above the ground or 2 or 3 sun in the soil. The shapes are varied. A man observed recently that all he saw in a mountain area had the plant growing out of the worm's mouth. In the Kumano Mountain it grows at the foot of the mulberry trees; length 2 or 3 sun; and looks like a slender holder of a writing brush. The worms were brown and they squirmed, and from their mouths threadlike things were growing in clusters.

Remarkable as it may seem, the old Japanese literature seems to have had a whole volume on the recondite subject of clavate fungi growing from the bodies of dead insects. Serrurier cities (Cat., No. 1023): Yunoki Tokiva, Ka-sau toutsiu no dzu [Kasōtōchū no Zu] (Dessins des insectes de hiver et des plantes de l'été....Série de planches en couleurs avec quelques notes...) s. l., 1801. As is frequently true of Japanese books, the title gives no clue to the subject matter of this one.

Fig. 5. Reproduction of one of the colored figures from Tōdō Ihitsu, showing the blue-green lepidopterous larva called tegu on chestnut leaves.

This insect yields "cat-gut" for fishing lines, a transparent and very strong thread. In April or May, when fully grown, the tegu looks like a silk-worm, is blue-green (according to the colored illustration) with black head and legs, and a "sting" at its tail. It is covered with white hairs. Cut it open longitudinally, said Tōdō, to find the two lines of thread, which may be stretched out to a length of 5 or 6 shaku (about the same number of feet). To raise the "worm" (caterpiller) plant chestnut or wax trees and dig a ditch around them to keep the worms from escaping.

According to the dictionaries the larva that yields "cat-gut" (tegusu) is a wild silkworm especially common in the mountains of Hiroshima district. It is there known as yamamayu (mountain silk-worm). The dictionaries give "Japanese oak worm," "tussah" and "tussore" as English equivalents. The word tussah is defined as coarse strong silk produced by "undomesticated" silkworms and also as the name of the insects, one of them being Antheraea paphia.

Exhibit 8. Kiuchi Koshige, Kōjōsekiwa Unkonshi (Record of unusual stones). 18 vols. Ōsaka, An'ei 2 (1773).

This work on stones contains stories calculated to tax the credulity of the most credulous, but also some credible natural history. Although medieval and folk-loristic in flavor and not covering the whole field of natural history it is placed here for want of a more appropriate category in our classification. It contains perhaps as early an illustration as illustration as one can find of fossil Japanese gymnosperm cones. There are such titles and entries as: "stones that have been transformed from other things, animate and inanimate," "a woman named Tora transformed into a tiger while grieving for her dead lover"; "stones once deposited inside an animal's stomach"; "stones quite resembling familiar everyday things"; "stones loved by people"; "fossils, etc."; "ancient people's sculptures, dug up from underground." One of the volumes illustrates "a Dutchman buying a stone in which a fish is swimming. He bought it to be presented to his noble officer, for when a part of the stone is ground off, one can see the fish alive inside the stone."

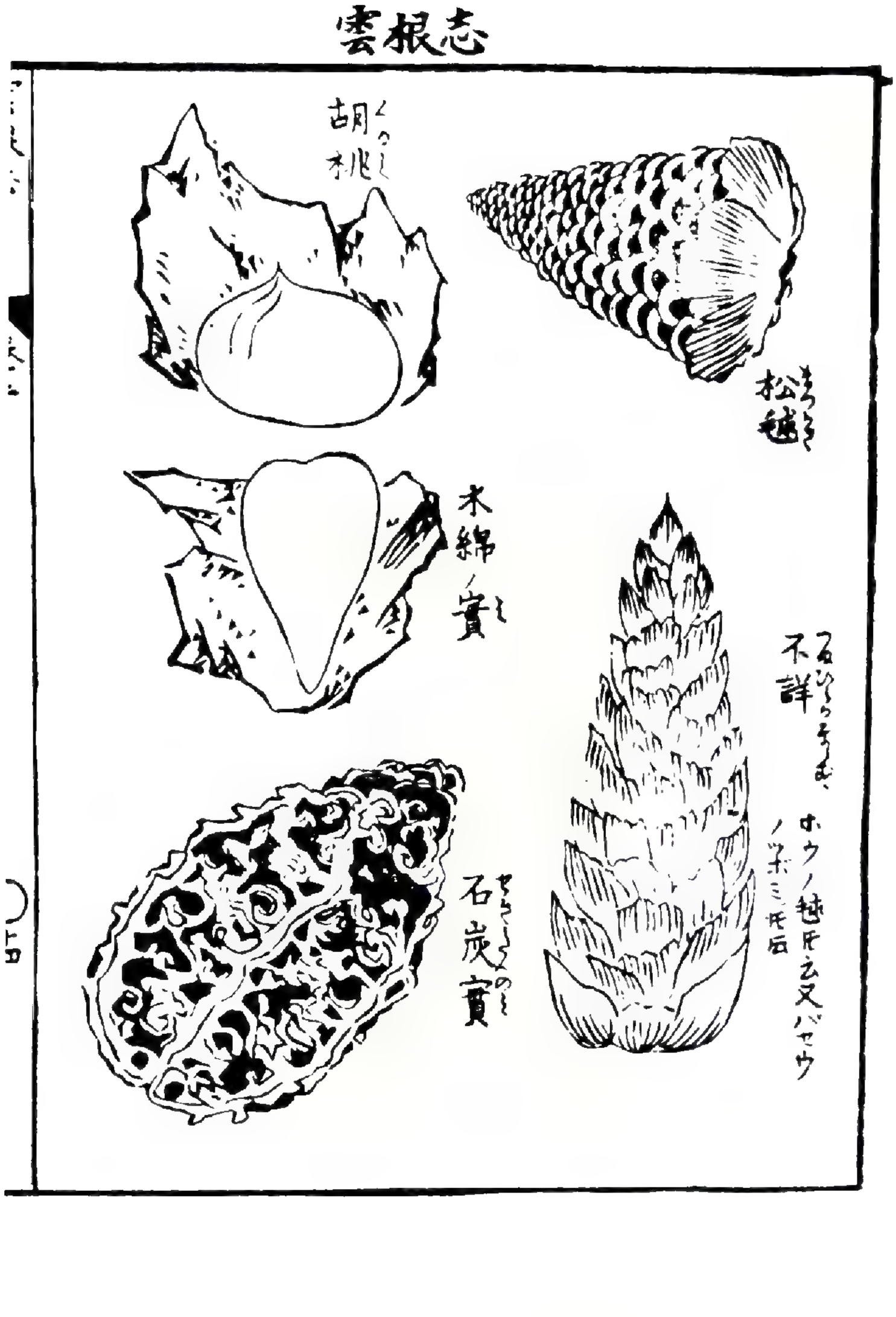


Fig. 6. Fossil gymnosperm cones as figured by Kiuchi Koshige in the Record of Unusual Stones.

Exhibit 9. Kaibara Ekken, Yamato Honzō (Yamato natural history) 16 parts in 5 vols. Kyōto, Hōei 5 (1708-1709; actually published). Vol. VI contains (I) Yamato Honzō Furoku (Appendix to Yamato natural history) 2 parts (or "volumes"), and (II) Yamato Honzō Shohinzu (Miscellaneous illustrations) 2 parts ("volumes") with 85 consecutively numbered leaves. (part I, lvs. 1-54; part II, lvs. 55-84, figs.; leaf 85, postface). Kyoto, Shotoku 5 (1715).

Another issue: ("Revised"), 16 parts in 8 vols.; Appendix, 2 parts in 1 vol.; illustrations, 2 parts on 84 consecutively numbered leaves in 1 vol. No postface: 10 vols. in all. Kyōto: Bookstore Nagata Chōhei, Shōtoku 5 (1715).

One wonders if the "revised" issue of the same year as the original cannot be explained as referring to numerous manuscript emendations and additions, which may have been made uniformly in a number of copies which were offered for sale. It is not impossible, on the contrary, that the "revision" with manuscript changes was never regularly published and that the copy exhibited is unique. The same pages from the original and "revised" copies are illustrated to show the nature of the manuscript emendations.

Modern typeset edition, edited by Shirai Mitsutarō, 2 vols., Tōkyō, 1932 and 1936. This work is historically of such preeminence that the content of the 16 parts or books that were grouped by the publisher for binding as vols. I to V (not including Vol. VI, the Appendices) should be enumerated, as illustrating Kaibara's classification of natural things. Part I has the table of contents and general introduction; II, medicines and drinks; III, the various kinds of water; IV, fire (10 kinds!), metals, beads, stones, earth (67 kinds); grains (26 kinds) and spirituous drinks (29 kinds); V, VI, and VII, three books of herbs, containing 67, 79, and 73 kinds, respectively; VIII, melons (9 kinds), vines (27 kinds) plants of various sorts (16), water plants (36 kinds), and marine plants (28 kinds); IX, miscellaneous plants (34 kinds); X, the "four trees" (i.e., woody plants) of industry and fruit trees (7 kinds); XI, medicinal "trees" (37 kinds) and garden "trees" (36 kinds); XII flowering "trees" (40 kinds) and miscellaneous (92 kinds); XIII, fish (river fish, 39 kinds, ocean fish, 83 kinds); XIV, water and marine "insects" (i.e., invertebrates) (20 kinds) and land "insects" (64 kinds); XV, birds, grouped as water birds (25 kinds), mountain birds (12 kinds), domestic birds (4 kinds), miscellaneous birds (10 kinds) and foreign birds (10 kinds); XVI, "animals" (i.e., mostly quadrupeds) 46 kinds; human beings and derived things, such as mummies, nails, hair, etc. (10 kinds). Total, 1362 kinds of things.

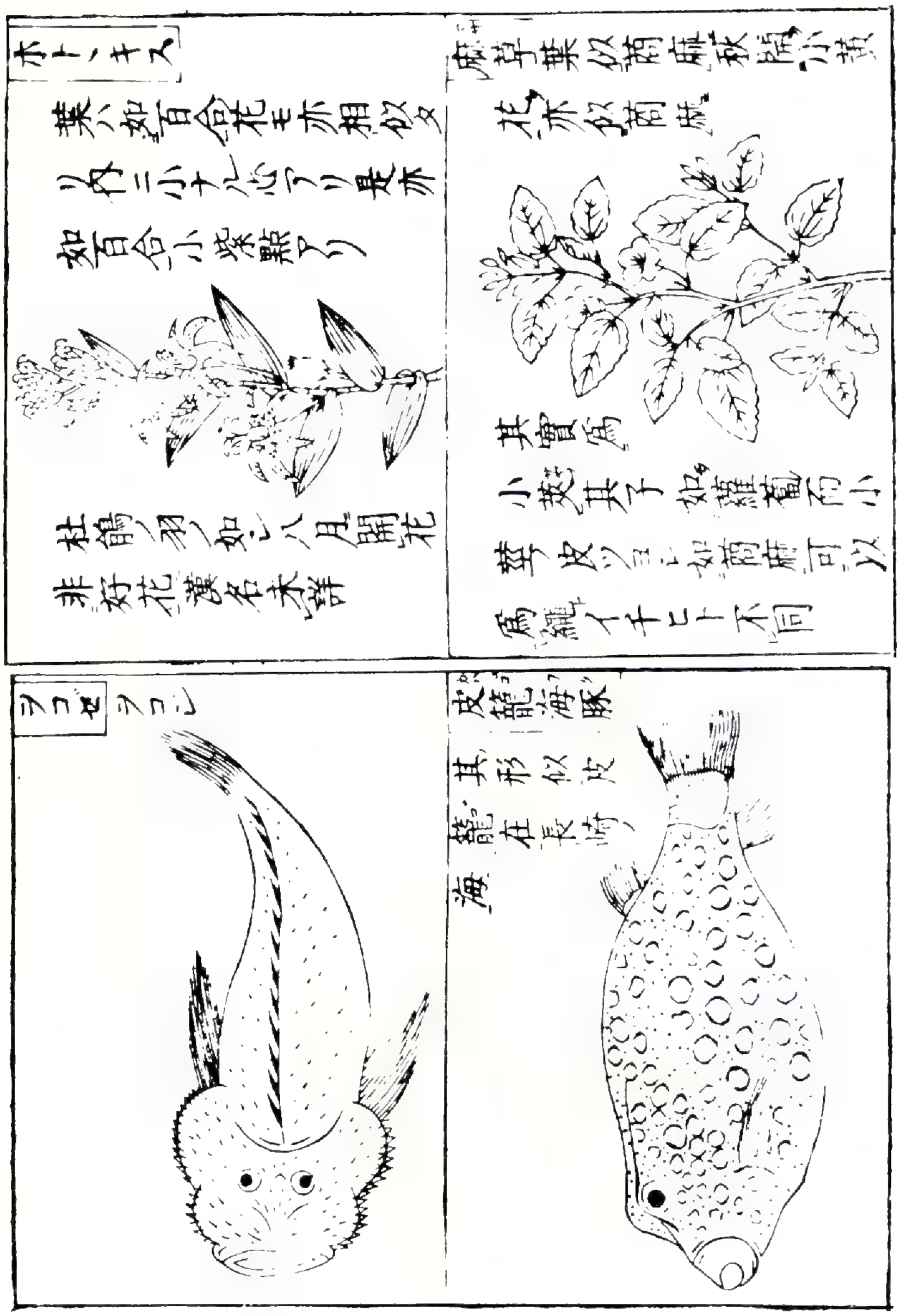
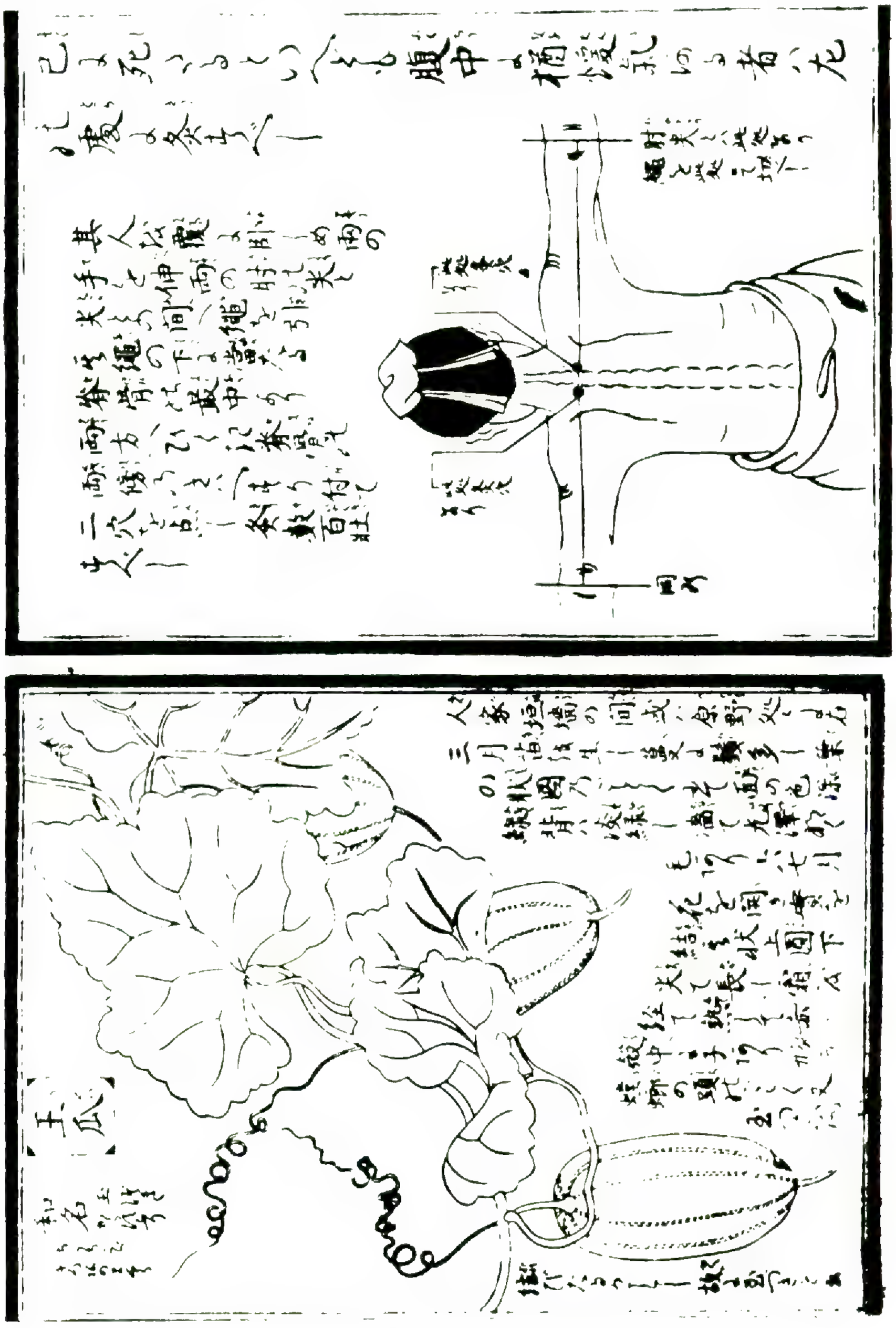


Fig. 7. Pages from the original issue of the Yamato Honzō. Left (fish); above, Inimicus japonicus; below, Ostracion tuberculatum. Right (plants); above, Tricyrtis hirta Hooker; below, Corchoropsis tomentosa Makino. The latter is described as a kind of hemp plant named asagusa with leaves and flowers resembling those of indoasa, which is Corchorus. Agreement is good with the significance of the scientific name Corchoropsis.

III. WORKS ON MEDICINE WITH SOME REFERENCE TO NATURAL HISTORY IN CONNECTION WITH MATERIA MEDICA. (Exhibits 10 to 11)

Exhibit 10. Taki Yasumoto, Kōkeisai Kyūhō, Jō; Chū; Ge (First aid in sudden illness, Vols. I, II, III). Osaka: bookstores, Akitaya Taemon and two others; Edo: Bookstores, Okadaya Kishichi and six others, Kansei 2 (1790). Volume I, t.+ 4+4+12+2+79 lvs.; Volume II, 3 95 lvs.; Volume III, 94+1+1+5+1 leaves.



Figs. 8 a and b

Figs. 8 a and b. Adjoining figures from the book of Taki on First aid in sudden illness (Volume I, leaves 43-44) showing on the left the snake gourd, Trichosanthes cucumeroides (karasuuri in Japanese) and on the right an unconscious, possibly dead, man. The instructions are to lay him on his face with arms out-stretched, to pass a rope from elbow to elbow, and on the line of the rope to cauterize a spot on each side of the spine by burning moxa on it. Burning moxa at specified points on the body was standard medical practice for many ailments. The substance called mokusa (mogusa) in Japanese is the tomentum brushed off of the leaves of yomogi (herb for cauterizing) identified as Artemisia indica, but the tomentum of various other plants was apparently used, among them, Senecio and certain ferns. A Chinese wormwood, Artemisia Moxa, received its specific name because of the use of the abundant tomentum in medicine, and the plant as well as the product bears the name. The word moxa (mokusa; mogusa) is a contraction of moegusa, "burning herb" from its medical use as a cautery.

Exhibit 11. Okamoto Ippō, Wago Honzō Kōmoku (Treatise on drugs in Japanese terms). 23 books in 10 volumes. Kyōto: publisher, Kosaji Han'emon, Genroku 11 (1698). Another title for the same work is Koeki Honzo Taisei.

This sparsely illustrated work deals with 1834 varieties of plants, animal, and mineral drugs. The drawings, copied from ancient sources, are very bad. Here are interesting drawings such as Ginseng, suggesting the fancied resemblance to the human form, which was considered an indication of efficacy. In the preface a certain Ri is mentioned, on whose work this one may possibly be based.

IV. FAMINE HERBALS (Exhibits 12 to 14)

Exhibit 12. [Matsuoka Gentatsu (Joan), editor], Kyūkō Honzō, Kōsei (Famine relief plants, revised). 8 vols. Kyōto: publisher, Nagamatsudō, Shōtoku 5 (1715).

Vol. 1: Prefaces by Itō Chōin, Matsuoka Gentatsu (on famine plants in general), Kagawa Shōtoku (on famine vegetables) and the Chinese author of the Ming dynasty (on famine grains, koku); Part 1, Kyūkō Yafu (Famine relief herbs) illustrated and described by Ōseirō (Wang Hsi-lou); Part 2, Kyūkō Yafu, Hoi (Supplement) by Yokasei (Yao K'o-cheng) of the Ming dynasty. Vols. 2 - 8, Kyūkō Honzō, Kōsei (Famine relief plants, revised), 14 parts, by Shu Ken'o of the Ch'ing period. Vol. 2 contains Introduction and part 1; Vol. 3, parts 2 and 3; Vol. 4, parts 4 and 5; Vol. 5, parts 6 and 7; Vol. 6, parts 8 and 9; Vol. 7, parts 10, 11 and 12; Vol. 8, parts 13 and 14.

Fig. 9. For illustrations from the less extensive and earlier of the Chinese works edited by Matsuoka for his "famine herbal" we have chosen two extremely unrealistic figures that remind one of some early European herbals in which the same woodcut had to serve for two or more subjects. The illustrator has modified his

amazingly crude picture of the dandelion (Taraxacum sp.) to appear as that of the Shepherd's Purse (Capsella Bursa-pastoris) or vice versa.

Exhibit 13. (same work as Exhibit 12) Matsuoka Joan (editor). Kōsei Kyūkō Honzō (Famine relief plants, revised). 14 vols. in 7. Kyōto: Hakushōdō, Ryūshidō, Gansuitei, joint printers; Fujino Kurōbei, Ibaragi Tazaemon and Kawakatsu Shichirōbei, publishers, Kyōho 1 (1716). (2nd ed.)

This edition differs from the first in that the supplement to the Kyūkō Yafu is incorporated with that work. Commenting on this edition, Shirai remarked of the former, which had appeared a year earlier, that Matsuoka Gentatsu had constructed it by adding to the original Chinese characters the marks which would enable them to be read in Japanese, had given the Japanese names of the plants wherever possible, and had induced Hakuundō of Kyōto to print it.

Fig. 10. This more extensive of the two famine herbals edited by Matsuoka has superior woodcuts and we reproduce one of the best, illustrating a variety of Coix Lachryma-Jobi (Job's tears) which, in contrast with that reproduced from Takebe Seian (no. 11) has close internodes, lower growth, and relatively broad leaves. This is presumed to be the same type (probably grown in both China and Japan) which has received the scientific name of Coix Ma-Yuen Makino, or Coix Lachryma-Jobi var. frumentacea Makino. The grain, enclosed in a horny involucre, is edible, but it took considerable labor to prepare it. It is called tō mugi in the present text, and is sweetish. If boiled in water it makes a sticky gruel or mush like that of glutinous rice. It is very fragrant, our author says, and good food for the sick.

Exhibit 14. Takebe Seian, Bikō Sōmoku Zu, Kan, Kon. (Pictures of Plants necessary in preparation for Famine Relief). Completed in Myōwa 8, 1771. Illustrated by Kitago Shimei. Publication provided for by the author's descendant, Sugita Rikkei, with original pictures corrected by Sugita Rikkei and others. Prefaces by Takebe Seian, Sugita Rikkei and Ōtsuki Gantaku's heir. 2 vols., n. p. (Copyright: Tenshinrō-zō), Tempo 4, 1833.

Serrurier (Cat. 983), gives the descendant's name as Sugita Haku-gen; Shirai as Sugita Rikkei. Sugita Rikkei had inherited the manuscript and was aided in publication by those feudalcan physicians who contributed prefaces.

In addition to the printed copy we exhibit an old manuscript tracing of incredible perfection. It is almost the same in the coarser parts, but diverges more clearly in those parts where there are numerous fine lines close together. Someone must have wanted a copy very much to have gone to such extraordinary pains to have even text as well as pictures made almost minutely identical. In our exhibition the printed and manuscript copies are opened to corresponding pages for comparison.

備荒草木圖

Fig. 11. The grass Coix Lachryma-Jobi, known as Job's tears, a tall variety with relatively narrow leaves and long internodes, called zuzutama (river grain). Cakes could be made of grain and leaves pounded together, or of flour from the grain alone. Compare this illustration from Takebe Seian's famine herbal with the very different variety in Matsuoka's famine herbal, a low, broad-leaved type. Structurally the genus Coix is a highly evolved and interesting group with hard, shining involucres which, enable these seed-like structures to be strung on a cord as beads.

Ōtsuki Gentaku's preface relates the origin of this work, which he knew about from his father, Gentaku. The work was written with the aid of his father and by the physician Takebe Seian. They had experienced the memorable famines in Ōshū during the Genroku and Hōreki periods (1688-1703; 1761-1763). The manuscript was left to Sugita Gempaku, who died in 1817 at the age of 78 with-

out having procured its publication. It passed to the heir of Gempaku. Famine recurred and Sugita Rikkei (Rikkyo) physician to the Wakasu clan took the work to Ono Ranzan for examination. Revised by these various herbalists and with the original illustrations of Kitago Shimbei corrected, the herbal came into the hands of Hakūgen, heir to Gempaku, who presumably arranged for publication.

The two volumes contain pictures and instructions for the use of 104 edible plants.

V. EARLY MONOGRAPHIC BOTANICAL AND ZOOLOGICAL WORKS SHOWING LITTLE OR NO EUROPEAN INFLUENCE (Exhibits 15 to 20)

Exhibit 15. Sakurai Tsutomu, Dai-Nihon Jumokushi Ryaku (Abbreviated history of Japanese plants). n. p. [Tōkyō?], Government Geographical Bureau, Meiji 10 (1878). A work bound in European style, printed on sheets with two pages of typographic text on one side and two half-engravings on the other, assembled in fives (except at ends of the volume) and folded to make false signatures of 20 unnumbered pages each. The treatment of each of 100 species occupies two text pages plus two pages on each of which is half of a divided illustration in the style of the old woodblock diptychs. One species is the unique and therefore famous square-stemmed bamboo (Bambusa quadriangularis Fenzi; Tetragonocalamus quadriangularis Nakai; Chimonobambusa quadrangularis Makino) and in general the species chosen for illustration in this rather sumptuous book were not of medicinal value and had therefore received too little attention.

Exhibit 16 . Itō Ihei, Chikinsō (View of the earth's raiment). Illustrated treatise on flowers, including maple leaves. 20 vols., Edo, 1710, 1719, 1733. Two series, with volumes numbered consecutively, and supplementary series of 4 vols. Vols. I-VIII, Zōho Chikinsō, with general title preceded by Zōho (revised, enlarged), 1710; Vols. IX-XVI, with general title preceded by Kōeki (publicly useful); supplementary series, Vols. I-III with general title followed by Furoku (additions) and an odd volume with repetition of the title and volume number of Vol. XI, but entirely different in text and figures, although both deal with the same subject, maple leaves, which, by the Japanese, were considered "flowers" because of their bright fall coloring. This odd volume is bibliographically considered Vol. IV of the supplement, and Vol. XX of the complete series. There was an edition of the supplement in 1740, (fide Serrurier, Cat., no. 1052) which may have indicated the odd volume as Vol. IV. The British Museum seems

to lack the supplement but has the sixteen vols. of the two first series. (See Anderson Cat. under Ihei). Merrill and Walker (47) catalogue the supplement of 1733 as three books only, making the total 19 books.

Fig. 12a. To illustrate Chikinsō (for the drawings of the three series are quite different in style) we have chosen a figure showing the sacred lotus (Nelumbo nucifera), buckbean (Menyanthes trifoliata), a grass (? Eulalia), an Iris, an arrow-head (Sagittaria trifolia) and a water-lily (Nymphaea tetragona). The artist of this first series seems to have laid out a whole group of specimens (representing a habitat) more or less overlapping each other, and to have drawn all together. Each kind is represented with a name-tag attached. The general effect is not unlike that of the illustrations in Parkinson's Paradisus.

Fig. 12b. Arisaema serratum (hakunanshō) a Japanese jack-in-the pulpit of the group tennanshō, and Polygonatum japonicum (izui) a Solomon's seal, (more often called amodokoro) (Vol. XII, leaves 25-26 of Kōeki Chikinsō). The artist has drawn (or the wood-engraver has cut) single full-page figures, with very unequal success.

廣益地錦抄

Fig. 12c. Botanist Itō's figure of Igirisu sekichiku (English pinks), (from Chikinsō Furoku Vol. II, leaves 38-39). Itō wrote during a time when all sorts of foreign things might have been coming into Japan from Europe by way of the Dutch contact at Nagasaki. Publication of Itō's work began not too long after the visit of Kaempfer, and it is pleasant to wonder if maybe Kaempfer had some ship-captain take European flower seeds back to his friends in Japan. Some of the pictures convey the same feeling as those in old European books that may have influenced L. H. Bailey in illustrating his charming Garden of Pinks.

Exhibit 17. Matsuoka Gentatsu, Igansai Ranhin. Jō; Ge (Eye-pleasing "Orchids" Volume I; II). 2 vols. Kyōto, Meiwa 9 (1772). (Date of censorship Kyōho 13, 1728; preface signed Zunan; publisher Sasaki Sōshirō. This work by the famous naturalist better known as Matsuoka Joan had earlier publication in 1728 and 1746.) Serrurier, Cat. 1056.

Fig. 13. This illustration from Matsuoka's Eye-pleasing orchids shows a member of the lily family, Liriope graminifolia Baker, classified as ran-pin. (The old Japanese botanists grouped orchids with certain other ornamental plants, and gave them names compounded with "ran.")

Exhibit 18. Hōbashi Yasukuni, Ehon Yazansō (Picture books of mountain and field plants). 5 volumes. Ōsaka: book-store, Shibukawa Seiemon, Hōreki 5 (1755). Illustrated by Kōsoken (Establishment); artist Tachibana Yasukuni; engraved by Fujimura Zen'emon and Fujie Shirōbei.

Later edition: similar format and content, 5 volumes, Ōsaka (bookstore, Yanagiwara Kibei), Bunka 3 (1806).

The work of the artist has been confused with that of his father, Morikuni Tachibana (ca. 1670? - ca. 1748?) some of whose illustrations were published (posthumously?) as late as 1760. The son certainly produced one of the most interesting and charming works of old Japanese botany.

Fig. 14

Fig. 14. Aquatic plants illustrated as a habitat group by Tachibana Yasukuni in the Ehon Yazansō: from left to right, Menyanthes trifoliata (mitsukashiwa), Eriocaulon nudicuspe (hoshigusa) Sagittaria sagittifolia, in double and single forms (yaeomodaka and omodaka, respectively), and a sterile Scirpus (?).

Exhibit 19. Matsuoka Gentatsu, Igansai Kaihin, Jō; Ge (Decorative shells and marine creatures). 2 vols. Kyōto: bookstores, Noda Yahei, Noda Tōhachi, Kanreki 8 (1758).

Vol. I of this little work, in which Matsuoka seems to have been assisted by his pupils, has an enumeration of crabs and shrimps (18+11 kinds) and of clams (29 kinds). Volume II lists conch-shells (14), turtles (5), miscellaneous animals (8) and Japanese shells (72). By no means all are illustrated, but there are several interesting pictures of crustaceans, better executed than the others.

Fig. 15. Matsuoka Gentatsu's pictures of the chitoseoi (literally, "1000 years old," above) and the ōgigani (ventral and dorsal views, below).

Exhibit 20. Ōeda Ryūhō, Kaizukushi-ura no Nishiki, Ten; Chi; Jin (The brocade of sea-shells, Vols. 1, 2, 3). Shells collected for decoration and games, not for food. Edo: Nishimura Genroku; Osaka: Shibukawa Seiemon, Kan'ei 4 (1751).

2d (?) edition: n. p., date given only as "year of the serpent" (a year recurring cyclically every 60 years; not 1749 because the original edition was of 1751; more probably 1809 than 1869).

Volumes 1 and 2 are paged continuously. Following the preface is a view of the seaside at Wakanoura, showing a party of shell gatherers, and followed by the names and descriptions of over a hundred shells (which are illustrated in Vol. 2). There follows a picture of Sumiyoshiura during the low tide on a date corresponding to March 3d. This is followed by names and descriptions of 36 shells named Zenkasen-gai after the thirty-six most renowned poets who lived prior to the 11th century. (See Papinot, 52) Then comes a picture of another seaside place, Takenoura, followed by an account of another group of 36 shells called Gokasen-gai after other famous poets also of the same early period who were chosen later. Then 54 varieties of shells are listed which were named for the 54 chapters of the famous ancient Tale of Genji, and are therefore called the Genji-gai. Next are listed and described the shells called Shinsen-rokkasen-gai, after a group of six very famous 9th-century poets known as Rokkasen. A picture of the renowned authoress of the Monogatari Genji will be found illustrating Exhibit 85, Fig. 78.

貝盡浦の錦

百介圖

Fig. 16

Fig. 16. A page of illustrations from the Kaizukushi-ura no Nishiki, the Brocade of Sea-shells. The Japanese names of these are, from top to bottom, and left to right, as follows: mekuhaja-kai; kochō-kai (from above and below); hotaru-kai; mushiro-kai; yamatori-kai; miru-kai; aoi-kai; takōte-kai; koma-ga-tsume-kai; washinotsume-kai; hototogisu-kai (2 views); asagao-kai; shibori-sakura-kai; tsukihi-kai; hane-kai.

The third volume consists mostly of illustrations of the shells and of poems associated with them. This work might be classified with the early works on natural history or with the commentaries on the natural history of ancient literature. It is also of ethnographic interest for the games played with shells as pieces or counters are doubtless very ancient indeed. A picture in volume 3 shows ladies playing a game with shells. Others show the displaying of a collection of shells kept in compartments of trays in a lacquer case.

VI. PIONEER FLORISTIC WORKS OF JAPAN AND RELATED AREAS (Exhibits 21 to 30)

(1) Pioneer Floristic Works cited by Franchet and Savatier

Exhibit 21. Iwasaki Tsunemasa (=Iwasaki Gaien), Honzō Zufu (Illustrated herbal). Artist, Okada Seifuku. 4 vols. Edo: bookstores, Suharaya Mohei and Yamashiroya Sahei, Bunsei 13 (1830).

Title slips on covers (original) number the volumes as I to IV, but they are numbered inside as V to VIII. Colophon of Vol. VIII (=IV) indicates that the four volumes are complete for "mountain herbs." The Library of Congress has two other volumes of this printed edition and a modern reprint of five volumes. The work was greatly extended in manuscript (see the following entry) and the whole of it eventually printed in 1920, under the supervision of Shirai, who later compiled and published an index.

Fig. 17

Fig. 17. Panax Ginseng C. A. Mey. The famous ninjin (otane ninjin), Oriental ginseng, to which almost miraculous properties were attributed by the Chinese herbalists. It was considered in Japan to be a kind of carrot (ninjin). (Honzō Zufu, vol. V, lvs. 4-5.)

Exhibit 22. Shimada Mitsufusa and Ono Ranzan, Kai (Selected flowering plants). 8 vols. Edo, 1759. Another ed., 1765. From the same blocks, with a few additions.

The Kai, one of the three Japanese works that is cited throughout by Franchet and Savatier (27) was begun by Shimada, whose chief pen-name was Yonan-shi (he also used Yonan-den, Yonan-den-shi, Yonan-den Terufusa) who asked for the aid of Ono Ranzan after he had completed two of the eight parts, containing fifty of the species. It appears that Ono Ranzan completed the work, and was therefore mainly responsible for three-fourths of the total.

There were apparently two reprints of the work after its original publication, with only minor changes. One figure partly omitted from the first issue was filled in, and another was added where the short text had left room for it.

This really beautiful publication came to the attention of the French botanist Savatier, who did the field work on which the Enumeration of Japanese Plants by Franchet and Savatier (27) was based. He was greatly impressed by it and prepared a French translation which was published in Paris without the figures.

See illustration from Kai (Fig. 18) on the following page.

花彙

Fig. 18
134

Fig. 18. Two varieties of Asarum Blumei (ran'yō) as figured in the Kai of Shimada Mitsufusa and Ono Ranzan. Different varietal names are not given, and the peculiar sort on the right, with retuse leaves, may be assumed to be a rare variation which may have been propagated but subsequently lost, since such a form is not accounted for in Makino's Illustrated Flora of Nippon. The name ran'yō is not to be translated as derived from ran (egg) + yō (leaf) but from ran in the less usual sense of variegated.

Exhibit 23. Iwasaki Tsunemasa, Honzō Zufu (Illustrated herbal). Manuscript continuation, n. d. (ca. 1844-1856). A few of the late volumes: Vols. 62, 63, 70, 73, 74, 80, 83, 89, 90, (the foregoing 9 vols. bound in 6) plus 4 unnumbered vols. of paintings only, lacking captions and text. "The pictures were made by Takemoto Sekite."

This basic work in the history of Japanese botany, of which odd volumes only are available for exhibition, was begun in 1828. Eight volumes may possibly have been printed, but only six have been seen, the publication of the others being inferred from the fact that the four printed volumes in the exhibition are numbered inside V to VIII, although outside I to IV, and that two more volumes are in the Library of Congress, leaving only two unaccounted for.

As a manuscript with watercolor illustrations the Honzō Zufu was continued at the rate of about four volumes a year. On August 14, 1844, it appears to have been completed and dedicated to the Shōgun; in 1856 he was presented with a full set. Even odd volumes are excessively rare. There was a complete printed edition in 1921 in 93 volumes, with 2 additional volumes of index by the historian of Japanese science, Shirai.

本草圖譜

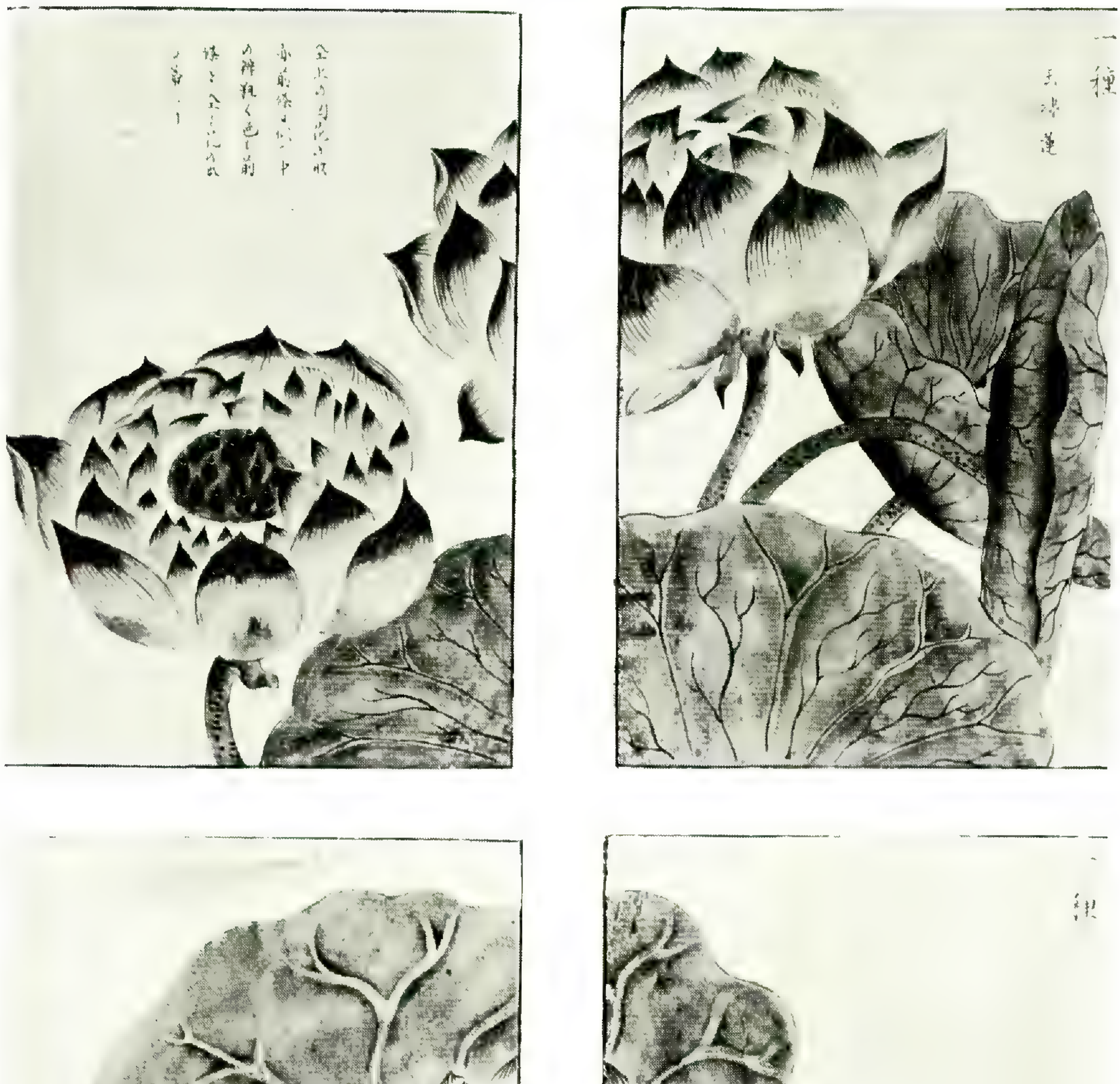


Fig. 19

Fig. 19. Nelumbo nucifera, the sacred lotus. Two illustrations from the manuscript Honzō Zufu showing variation from the usual condition in which the fruits are immersed in cavities opening on the flat top of the receptacle. If the specialized receptacle were considered to be phylogenetically recent, there would be (according to some theories) considerable likelihood of retrograde mutation to a more primitive condition such as that of fruits being borne on but not sunken into the receptacle. Such a condition is illustrated by Iwasaki.

(2) Pioneer Floristic Works showing European Influence and Final Post-Meiji Transition to Latin Nomenclature and Western Format

Exhibit 24. Itō Keisuke, Nihon Shokubutsu Zusetsu (Japanese plants illustrated). 1 vol. Kyōto, Meiji 7 (1874).

Illustrations and descriptions by Itō of 50 rare or interesting plants, with Savatier's French introduction reproduced xylographically from the latter's manuscript.

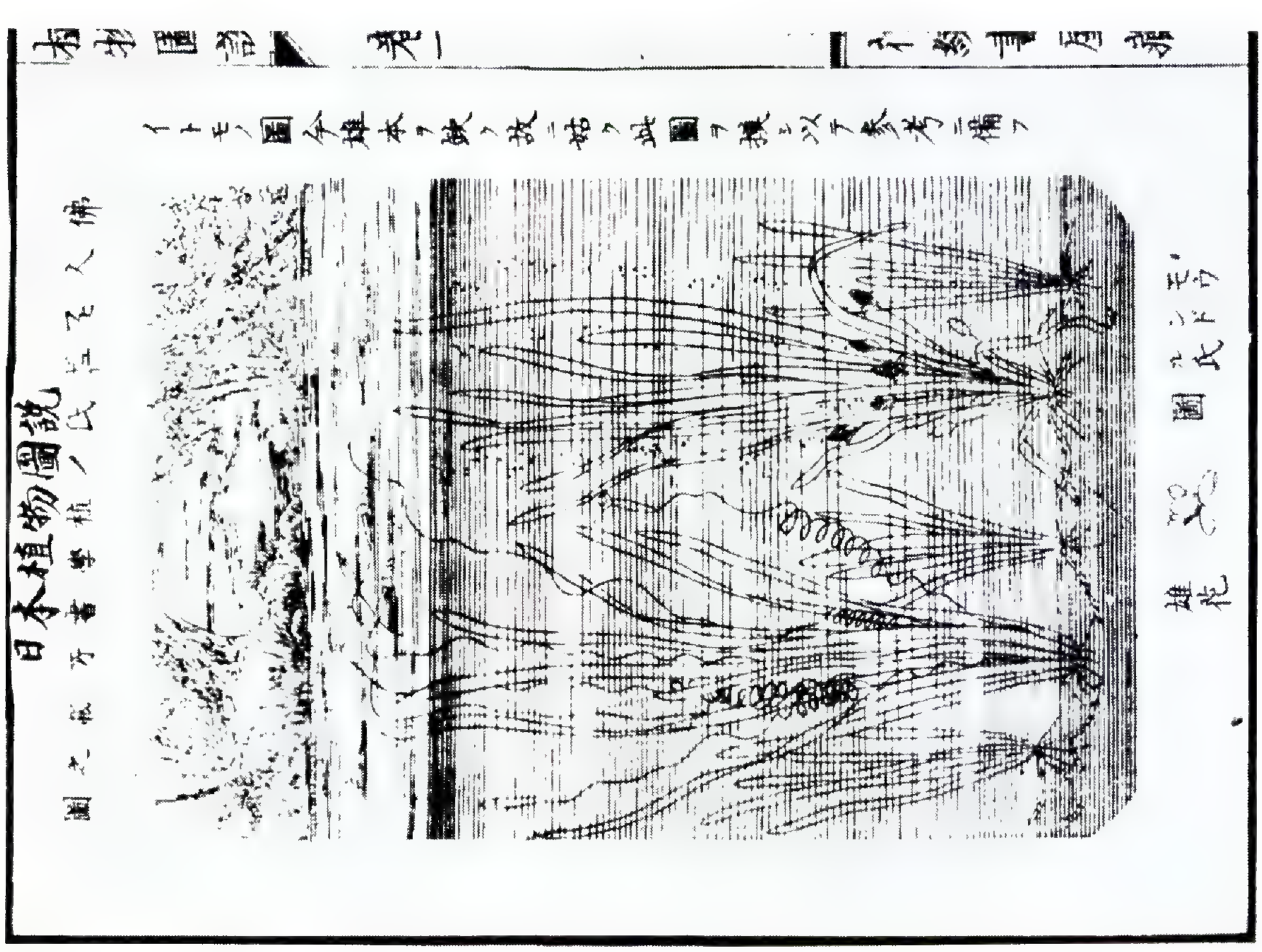


Fig. 20. Vallisneria spiralis, after Itō Keisuke. An interesting habitat picture showing spiral peduncles of floating pistillate flowers and the detached staminate flowers rising through the water to the surface.

Exhibit 25. Mizutani Yoshisaburō, Itō Keisuke, Ishiguro Masatoshi, Ōkōchi Shigeatsu, Yoshida Kōken, and Ōkubo Masafumi, Honzō Kaibutsuhin Mokuroku (Catalog of plants and related objects). 1 vol. Owari: publisher, Shōhyakusha, Tempo 6 (1835).

This work of 1837 has pasted in on a page left for its insertion the oldest copper-plate engraving of a botanical nature that our exhibition contains, namely an illustration of Reseda odorata L., the minonette, a European garden favorite, then new to Japan, one of the interesting foreign plants that had been discussed by the six persons who formed the Honzōkai (Plant Society) of Owari, and wrote this book. Some sections of the volume are identified by the red seals of their contributors. The list of items of natural history that had come before the Society occupies twenty pages, and the 31 single or double pages of pictures illustrate not only plants but also a mineral, mammals, fish, crustacea, insects, and molluses, the latter including many land snails. One picture of the edible lichen "Iceland moss" has the Latin and Dutch caption "Lichen islandicus; Yslandsch Schurftmos." All but two have Chinese or Japanese names only.

本草會物品目録

Fig. 21. Rehmannia lutea (shiroya), a famous plant in Chinese and Japanese materia medica. This form has "the stems and leaves about like the ordinary ones, but rather small and purplish. The light-yellow flowers bloom about the middle of May. There are no red flowers."

Exhibit 26. Kawahara Keiga, Keiga Shashinsō (Keiga Picture Series Library). 2 vols. Tempo 7th year, 1837. Vol. A, t. p. on inside cover + 4 + 33 lvs.; vol. B, 32 lvs. + colophon pasted on cover.

This series of pictures is entirely botanical, but has little text. It has accurate drawings of plants with floral analyses and other details drawn with unusual precision, and is one of the earliest works to give the Latin or Dutch names (with quite pardonable aberrations of spelling and identification) in European script. The Japanese text shows a distinct departure from the cursive to semi-cursive mixture of modified Chinese characters with syllabic hiragana which was usual at the time, to precisely written classical Chinese idiographs with clear and simple katakana. An interesting feature of the book is the occurrence of a couple of Malayan plant names introduced by the Dutch, these being "kanban malati," (kĕmbang mĕlati in modern standard spelling) for the Indian jasmine, Jasminum Sambac, and poedjoek for Aristolochia debilis, both belonging to genera that a Dutch visitor would have known in Java, if we presume that he went from there to Japan on one of the trading ships to Nagasaki. Keiga made many drawings for Von Siebold, who had resided in Japan from 1822 to 1829, and had visited Java. It was doubtless from him or from one of the several Japanese naturalists who had known von Siebold that Keiga got the Malayan names. Some of the European names (Dutch and English) unfortunately became a little scrambled between the making of the notes and the engraving of the blocks.

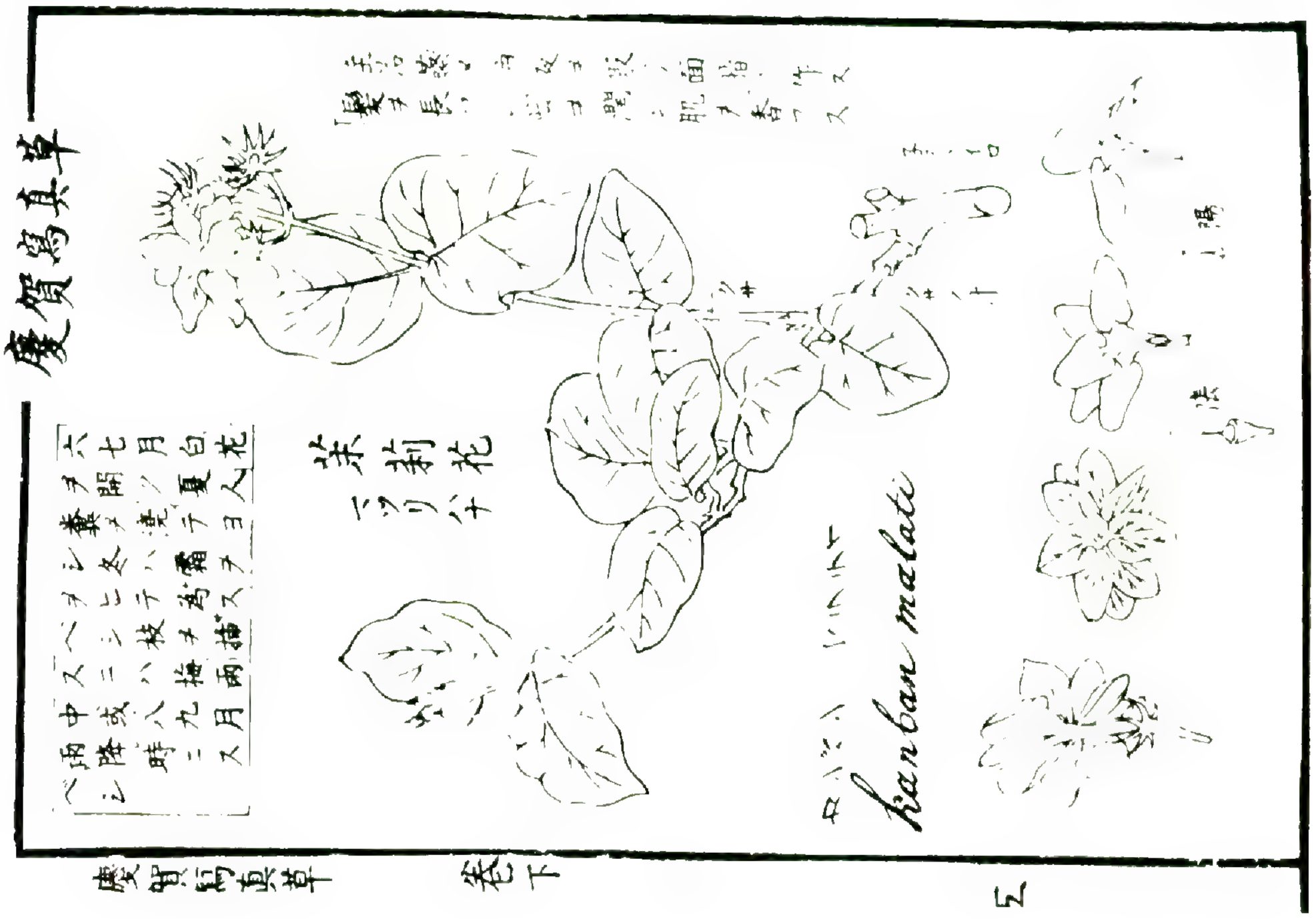


Fig. 22. This illustration may indicate plant introduction from Java or other points in the East Indies by the Dutch. Kĕmban mĕlati (Jasminum Sambac) is a favorite perfume flower with the Malays, early introduced into the Malayan region and then into the Philippines, where, instead of some native flower, it has been chosen as the National Flower. "Kanban malati" might have been a quite correct rendering of the name from some local dialect. (From the Keiga Shashinsō.)

Exhibit 27. Kawahara Keiga, Sōmoku Kajitsu Shashin Zufu (A collection of pictures of plants and fruits). 4 vols. Osaka: Maekawa Zembei, 1842.

This is a later edition (probably the second) of the preceding entry, under a new title, printed on thick paper with larger, colored illustrations. This edition is not mentioned by Shirai (71). The hand-written Dutch or Malay or English names are reproduced on the xylographic blocks with the Japanese text and the black outlines of the drawings. Kawahara Keiga's books show the influence of Von Siebold in giving details of flower structure as well as naturalistic drawings of the flowering or fruiting specimens. The "tea tree" (Fig. 23) is a typical example.

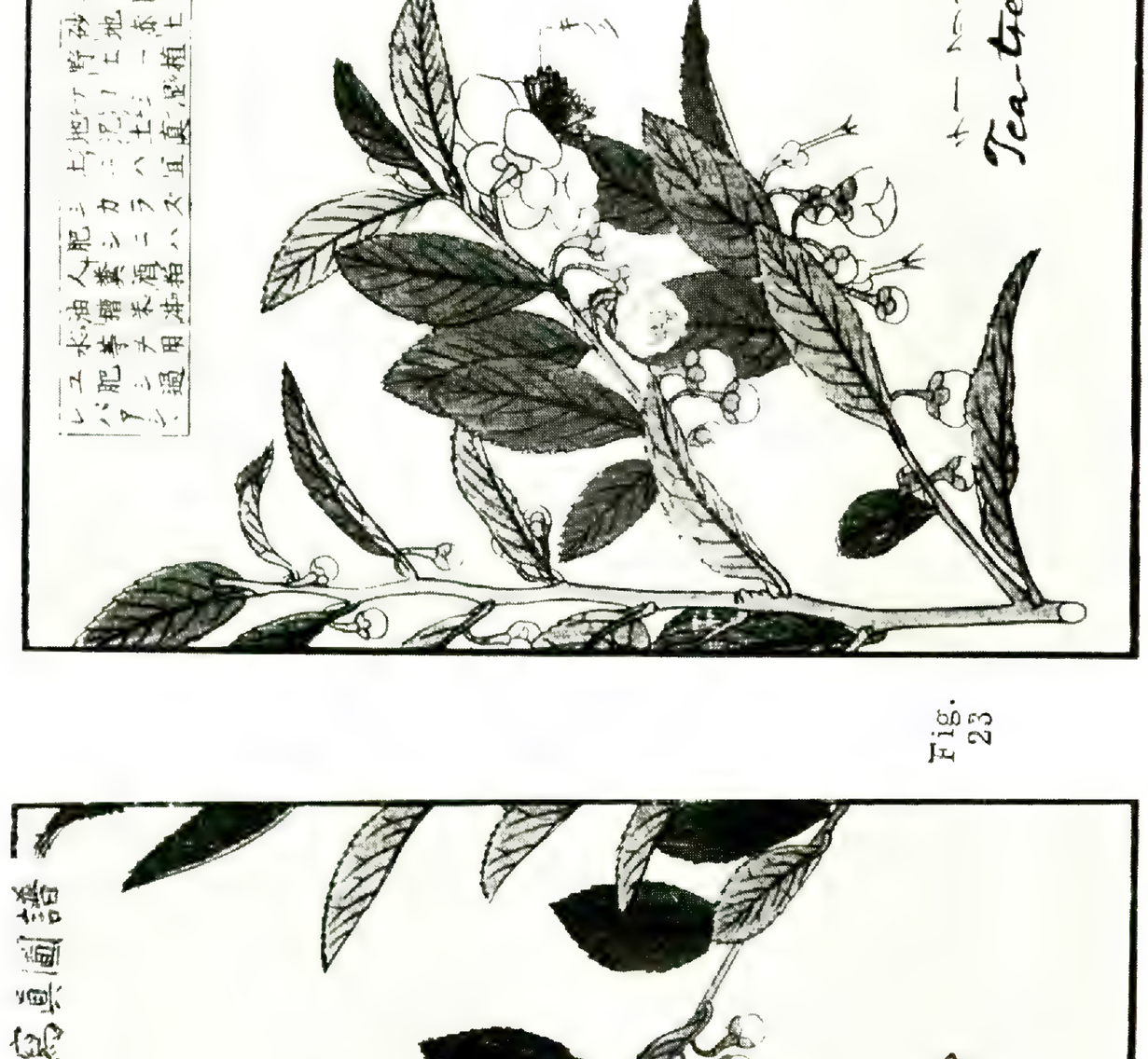


Fig. 23

Fig. 23. Kawahara Keiga's colored illustration of tea, from the second edition of his book. He says that the white flowers appear in September or October, that it thrives in sandy or red soil, that it does not do well in damp or muddy soil, and that it needs a moderate amount of fertilizer; also that it is good to dispel fevers, quench thirst, induce sleep and digestion of food, and for the eyesight.

Exhibit 28. Tanaka Yoshio, Yūyō Shokubutsu Zusetsu (Useful plants illustrated). 9 vols. Artist, Hattori Sessai. Tōkyō: original printing, Teikoku Hakubutsukan, i.e., Imperial Institute of Natural History; copyright, Japan Agricultural Society, Meiji 24 (1891).

A late work with block prints in color by a Japanese botanist who was one of the pioneers in the transition to Western science.

The palms of Japan, including the most northern of the East-Asiatic species, and the Ryūkyū cycad, Cycas revoluta, from Tanaka's Useful Plants. See Fig. 24 on the following page.

有用植物圖説

Fig. 24. The three palms, as interpreted by Makino and as currently identified in Japan, are Trachycarpus excelsa (Thunb.) Wendl., Rhapis humilis Blume (the R. flabelliformis of Tanaka), and Rhapis flabelliformis L'Her. (the Rhapis Kwannontsik of Tanaka).

Exhibit 29. Iinuma Yokusai, Shintei Sōmoku Zusetsu (Illustrated book of plants, revised). 20 vols. 2nd ed. Section on herbs only. Posthumously revised and published by Tanaka Yoshio and Ono Shokui. Tōkyō, 1874. Earlier editions of Sōmoku Zusetsu by Iinuma: 30 vols. in 1832; 20 vols. in 1856. Iinuma was a pupil of Ono Ranzan, studied Dutch, and shows much Western influence in botanical terms.

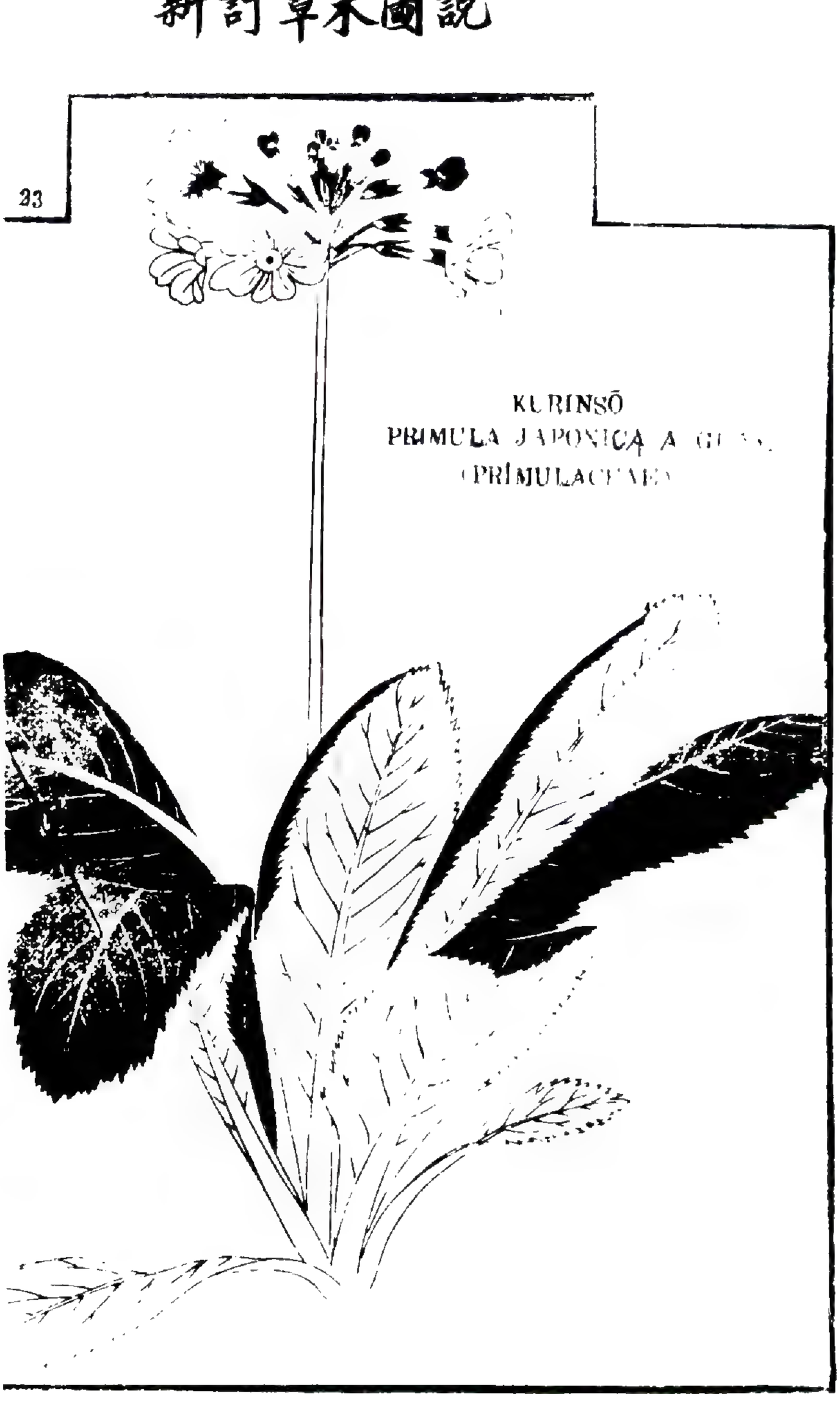


Fig. 25. Kurinsō, Primula Japonica from Shintei Sōmoku Zusetsu.

Exhibit 30. Makino Tomitarō, editor, Futsū Shokubutsu Zufu (Common plants illustrated). 5 vols. Tōkyō: Hakubutsugaku Kenkyūkai (i. e., Natural History Study Society), Murakoshi Michio, Society representative and publisher, 1909-1910.

This work is included because it is an early example of those showing complete transition to European methods of illustrating, printing and binding. Comparison of the plates gives evidence of experimentation with various techniques in the printing of this great assemblage of color plates by lithography. It illustrated approximately 2379 species of native, cultivated and introduced plants. The peculiar numbering of the figures has proved puzzling to bibliographers. There are two series of numbers. Vol. I contains only the beginning of the first series, figures 1 to 401. In Vols. II through V there is a consecutive run of figures of each series in each volume. One series of figures ends with No. 1817, the other with 574, but there are a couple of minor irregularities in numbering.

普通植物圖譜

(廿) 櫻草科 Primulaceae.

Fig. 26. Primula japonica Asa Gray (right), one of the plants brought back to the United States from Japan by the Ringgold and Rogers Expedition, and another primrose, apparently Primula Sieboldi (left), reproduced from Makino's Futsū Shokubutsu Zufu.

VII. ECONOMIC BOTANY IN GENERAL
(Exhibit 31)

Exhibit 31. Ōtsuki Gentaku (Ōtsuki Shigetada), Enroku, Jō; Chū; Ge (Book of tobacco, Vols. I, II, III). Edo, Bunka 6 (1809).

This old book on tobacco is ethnologically as well as botanically interesting, for it has illustrations of types of pipes that have long been wide-spread in Asia. One figure shows the pipe which was said to have been made for Toyotomi Hideyoshi in 1577. According to Kanda Kōichi's article on Tobacco in the Encyclopaedia Japonica, Vol. VI (Meiji 44, 1911), cultivation of tobacco in China began in the Manreki (1573-1619) period from seeds brought from Luzon, where tobacco was of course introduced by the Spaniards. The commercial product reached Japan as an import from Portugal in the Tenshō period (1573-1591) and seeds were first planted, according to Ōtsuki's account, in Keichō 10 (1605) at Sakura no Baba (near Nagasaki). Another account says the first planting was at Ibusuki, Satsuma, Kyūshū.

Ōtsuki referred to various European books of which one, by Dodonyūsu, was undoubtedly the herbal of Dodonaeus, which is known to have been in the library of the Shōgun. (The other works we do not recognize from the Japanese rendering of the names of the authors.)

According to Dickson (21) it was Monardes who first used the name tobacco in a printed work, and stated (as repeated by our Japanese author) that the Spaniards named it for the island (Tobago) where it was first seen by them.

Vol. I of the Enroku deals with the history and names of tobacco, its soil and locality preferences, cultivation and processing for market.

Vol. II deals with the therapeutic and poisonous effects of tobacco, the treatment of tobacco poisoning, and smoking apparatus (pipes, etc.).

Vol. III treats of tobacco from a psychological and aesthetic standpoint, with poems on smoking, and concludes with an appendix by a disciple of Ōtsuki and a translation from the Dutch.

Fig. 27. From the older of our two Japanese books on tobacco we have taken Ōtsuki's reproduction of an old European picture of "a native of the Tabako Island smoking." Thevet had a picture which might well be the source of the one in the Japanese book, and which has been recently reproduced by Sarah A. Dickson (21) in her interesting series of articles based upon the Arents Collection relating to tobacco, in the New York Public Library.

VIII. AGRICULTURAL BOTANY; AGRONOMY
(Exhibits 32 to 34)

Exhibit 32. Aoe Hide, Satsugū Ensō (Tabako) Roku (Tobacco of Satsuma and Ōsumi Provinces). 5 vols. Tōkyō: publisher, Maruya Zenshichi; painter, Seishibunsha (Paper Manufacturing Company), Meiji 14 (1881). Licenced for printing in the Prefectural Office, Kagoshima.

The numerous and elaborate inserted illustrations of this work show Aoe's distinct trend toward experimentation with newly introduced methods. He stated that when the manuscript was ready it was found that some of the illustrations were unsatisfactory, and it was thought that they might well be replaced by lithographs (ishihan). This was done, but flat coloring was overprinted from wood blocks. In addition, at the advice of a friend, the

plates were all carefully described at the end of the work. In the main the pictures were drawn from living plants, although a few were based upon careful descriptions. The legends for the illustrations were given in English as well as Japanese, and the Japanese text was type-set in clear kanji and katakana.

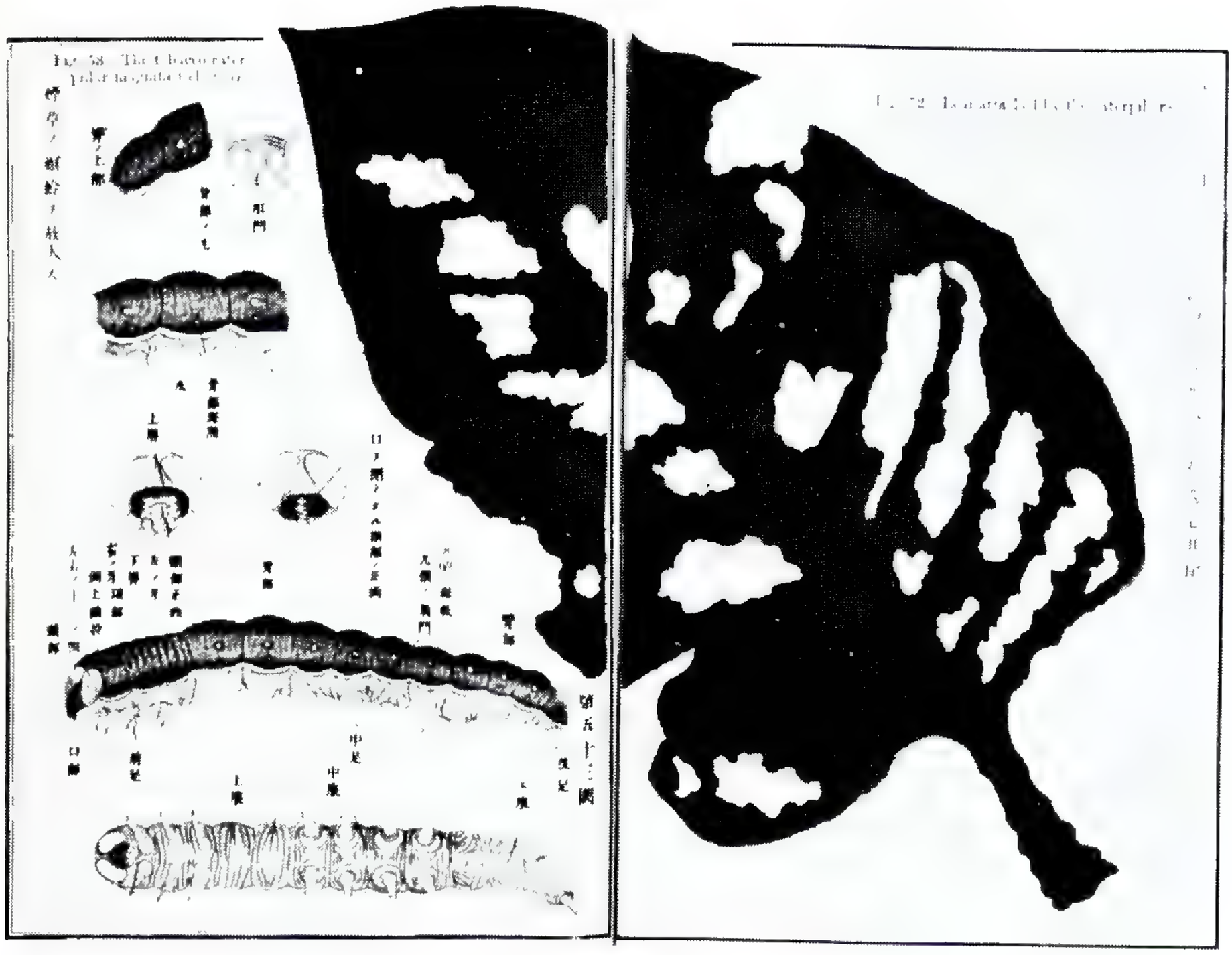


Fig. 28. A tobacco leaf damaged by a sphinx-moth caterpillar, with the pest itself; a good example of the numerous admirable plates of Aoe Hide's remarkable tobacco monograph, transitional from the old to the new in natural history and agricultural publication.

Exhibit 33. Sō Senshun (Sō Han) and Shirao Kokuchū, Seikei Zusetsu (Illustrated book of agriculture). 30 vols. Edo, Bunka 1 (1804).

Initiated in Kansei 5 (1793), by order of Shimazu, Feudal Lord of Satsuma (now Kagoshima Prefecture) Kyūshū and planned to be completed in 100 volumes, publication of this great work was twice interrupted by fire, and never progressed beyond the 30 volumes dealing with agricultural botany and a few wild food plants.

Fig. 29

Fig. 29. Above: the enormous herb with succulent, edible, petioles, Petasites japonicus (then called "fubuki" but "fuki" in modern dictionaries) (left), and a type of maize with kernels in the normally strictly staminate tassel (right). Below: two wild plants used for food, namely, the aquatic Brasenia Schreberi (left), and the tuberous Sagittaria sagittifolia var. edulis Sieb. called "nagi" (obsolete name) or "shiro-kuwai."

The Seikei Zusetsu has nothing to say about the anomalous maize variation, but does state that, if the kernels are the size of soy-beans, maize is called mamekibi in the northern part of Honshū. If the shape is unusual, the forms are called by names of foreign countries, even if not the products of those countries. Such are Tōkibi (T'ang millet), Namban millet (from the land of the Portuguese or "southern barbarians"), and Koma-kibi (Korean millet, from the old name Koma, for Korea). The three foreign-country "millet" varieties (i.e., maize) have purplish-red or yellow grains. "When roasted in a pan, the kernels burst and look like plum blossoms." This is an interesting record that the Japanese knew pop-corn before they had Yankee contacts! (From the great work on agricultural botany of Sō Senshun and the Natural Products Bureau of Kagoshima.)

Exhibit 34. Okura Nagatsune, Nōka-Eki (Benefiting farmers). 7 vols. various places and dates.

First series, Nōka-Eki, Ten. 3 vols. Ōsaka: publisher, Bunkindō, Kyōwa 2 (1802).

Second series, Nōka-Eki, Kōhen. 2 vols. Edo: bookstores, Suharaya Mohei, Suharaya Ihachi, and seven others; Ōsaka: publishers, Bunkindō and Hōzandō, n. d., but, according to Shirai, 1810.

Later series, Nōka-Eki, Zokuhen. 2 vols. Edo: bookstores, Suharaya Mohei and two others; Nagoya: Eirakuya Tōshirō; Kyōto: Maruya Zembei; Ōsaka: bookstores, Kawachiya Kihei and Kawachiya Tasuke; publisher, Bunkindō, Bunsei 1 (1818).

In the preface to the first series the author's friend, Mr. Okuno, says that of the four classes of society, samurai, farmers, artisans and merchants, those who work the hardest are the farmers, but in spite of that they remain poor. So when Mr. Ōkura brought the manuscript of his book to Ōsaka, Mr. Okuno was greatly impressed with it as indicating that the economic condition of some farmers could be improved by the cultivation of wax trees (Rhus succedanea) and the production of wax. So he urged its publication. The list of Ōkura's other works showed that he had already written on sugar, cotton, indigo, paper-making,

cultivation of cedar trees and of Paulownia, etc. In brief, he was a pioneer in economic botany and diversification of agriculture, as well as a skilled and ingenious propagator.

In the remarkable monograph on the wax tree he deals with processes of vegetative propagation in great detail, and evidently understood the importance of establishing clones from superior trees. He hoped that wax would become one of the leading agricultural products of Japan.

Fig. 30a. Cultivation of the wax tree, Rhus succedanea. (From Ōkura's Nōka-Eki.) A hill-farm with only a narrow valley or ravine available for rice, but, on the rough hillsides, round shelf-like niches have been excavated as sites for single wax trees.

Fig. 30b, c. Wax trees of superior productivity transplanted to a nursery site, with their branches grafted simultaneously to several seedlings, to which they would remain attached until the unions were firm. The binding of scions to the chosen stocks (left); three grafted seedlings after the top of the stock has been cut off, to be replaced by the growth of the scion (right). The scions still remain attached to fallen but still living parent tree of the new clone. Movement of the old tree by the wind, which might tear the scions from the seedling trees to which they are grafted, is prevented by tying the limbs of the old tree to stout stakes driven into the ground. The picture on the right shows a large old tree (being used as a source of scions) which might be supposed to have fallen over naturally, thus bringing its branches within reach for grafting to transplanted seedlings, but Ōkura states that trees chosen for multiplication by grafting were also dug up and "healed in" in a prone position among the nursery-grown seedlings which were to be used for stocks.

IX. HORTICULTURAL BOTANY
(Exhibits 35 to 54)

(1) Special Groups

Exhibit 35. Ikeda Jirōkichi, Saishiki Shasei Yushitsu Yuri Kashū (Album of lilies for export with colored sketches). 1 vol. Tōkyō: distributor, Ikeda Store, Meiji 28 (1895). A beautiful nursery trade catalogue, containing hand-colored wood-block prints of 36 species of lilies (yuri) and similar plants. As in so many Japanese color prints and paintings in which red lead was used as a pigment, proximity to compounds of sulphur has darkened and discolored some of the reds and oranges of this book, but it might be possible to restore the original color.

彩色寫生輸出百合花集全

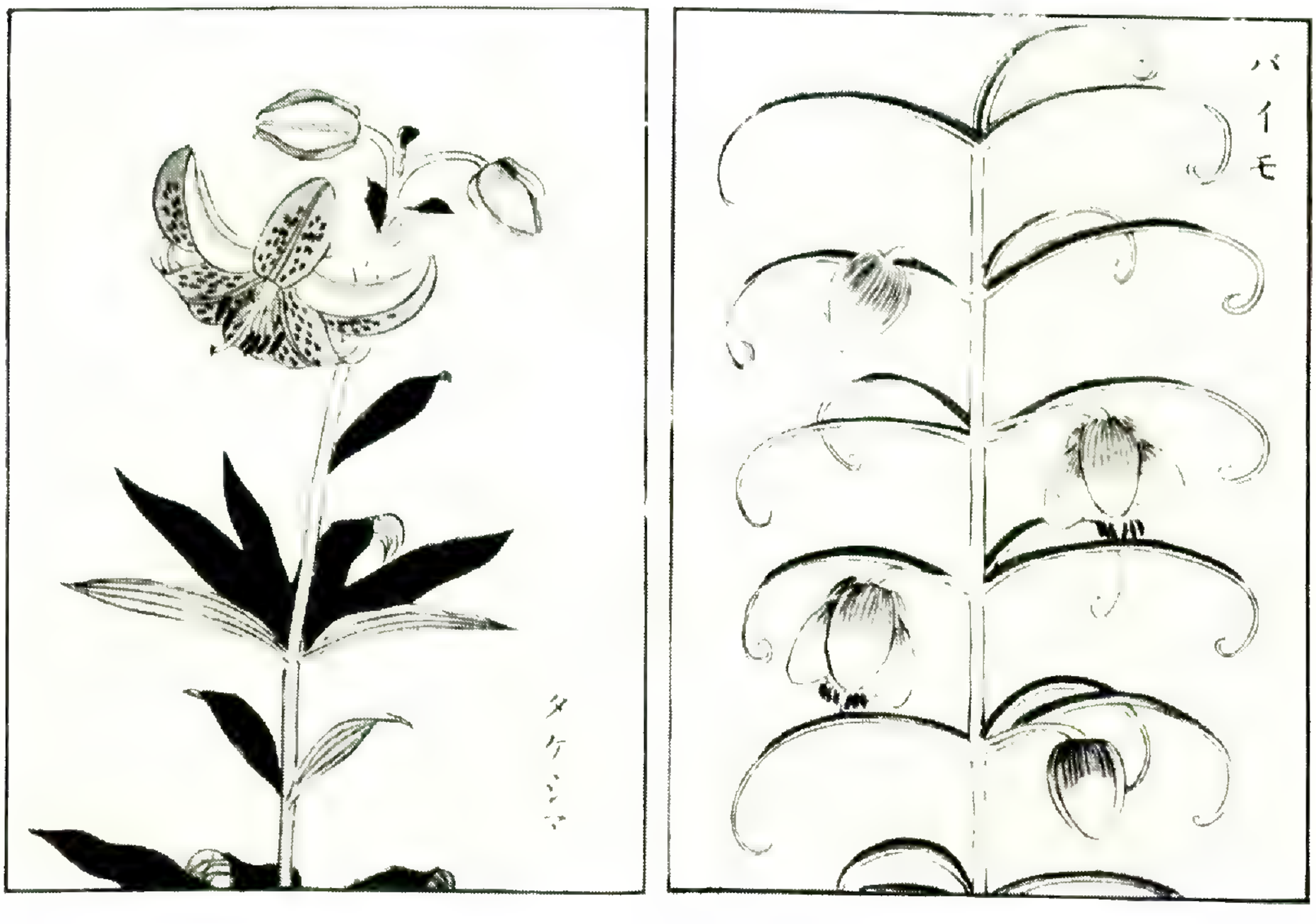


Fig. 31. Our illustration from the Ikeda catalogue shows Lilium Hansoni, Takeshima lily (left) (named for having come into Japanese cultivation from the Korean Island Takeshima) and Fritillaria Thunbergii (baimo), the latter named for Thunberg, one of the most famous students of Linnaeus, early botanical traveller in Japan, author of the Flora japonica. Its name is the Japanese pronunciation of the two characters of its Chinese name.

It is unfortunate from the standpoint of the history of plant

introduction and the origin of horticultural varieties that nursery catalogues have not been more generally kept in botanical libraries. They are frequently a source of information that is not elsewhere recorded at all, or not so authentically. This Ikeda catalogue is the earliest commercial publication of the sort that we have seen and the only one distinctively "old-Japanese" in aspect. It is therefore included here, although far too late in date to be associated with pre-Meiji books, except as a late hold-over of an earlier style of illustration than would be expected as late as Meiji 28 (1895).

Exhibit 36. Katayama Naoto, Nihon Chikufu (Japanese Bamboos). Edited by Ono Shokui. Illustrated by Nakajima Geisan. 3 vols. n. p., Meiji 19 (1886).

Although the author of this beautifully illustrated monograph emphasizes the more useful kinds of bamboos, he included decorative types for yard or indoor planting and other sorts that might be found useful in the future if brought into cultivation. It is interesting to find illustrations of teratological and pathological states.

日本竹譜

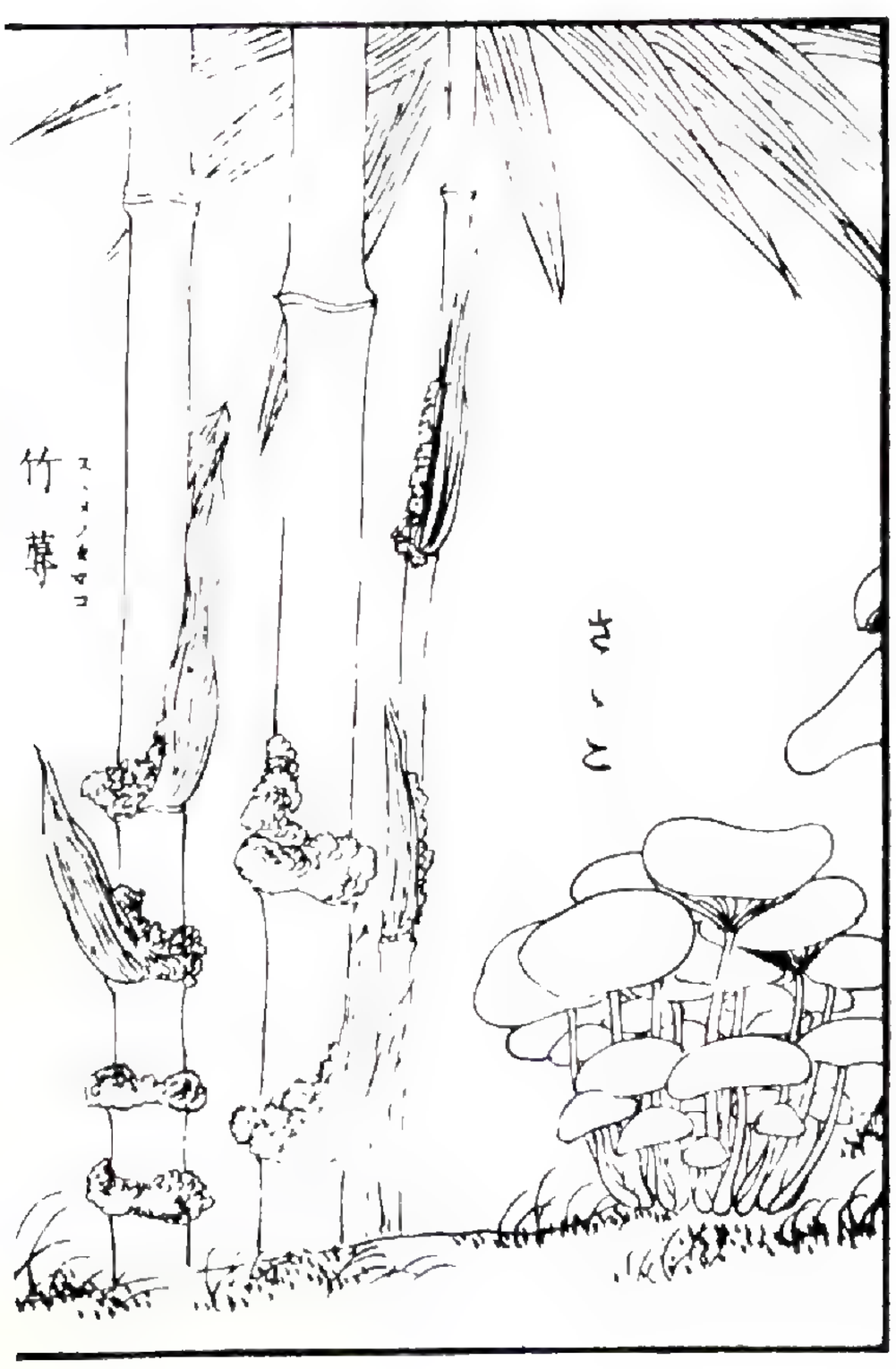


Fig. 32. An illustration from Katayama's monograph on Japanese bamboos showing (right) the kind of mushrooms (sasako), that grow at the roots of bamboo after rain, and that are "a little poisonous if white," and (left) the appearance of bamboo when the juice solidifies and becomes yellow and sweet. The substance is called susumenotamago (bamboo eggs) and children like to roast and eat it.

(2) Horticultural Hobby Specialties

Exhibit 37. Matsuoka Gentatsu, Baihin; Jō, Ge (Plum blossoms; Vols. I, II). Kyōto: joint copyright, Nakanishi Uhei and Andō Hachizaemon, Hōreki 10 (1760).

This posthumous monograph on sixty or more horticultural varieties of plums was edited by Kōga Keigen, who wrote the preface, and Imaeda Eisei, disciples of [Matsuoka] Gentatsu (Igansai) or Matsuoka Joan, who died in 1745. The illustrations are uncolored. At the end are listed various trees whose Japanese names ended in -ume (plum) and which might or might not actually be plums. Matsuoka had not seen their flowers.

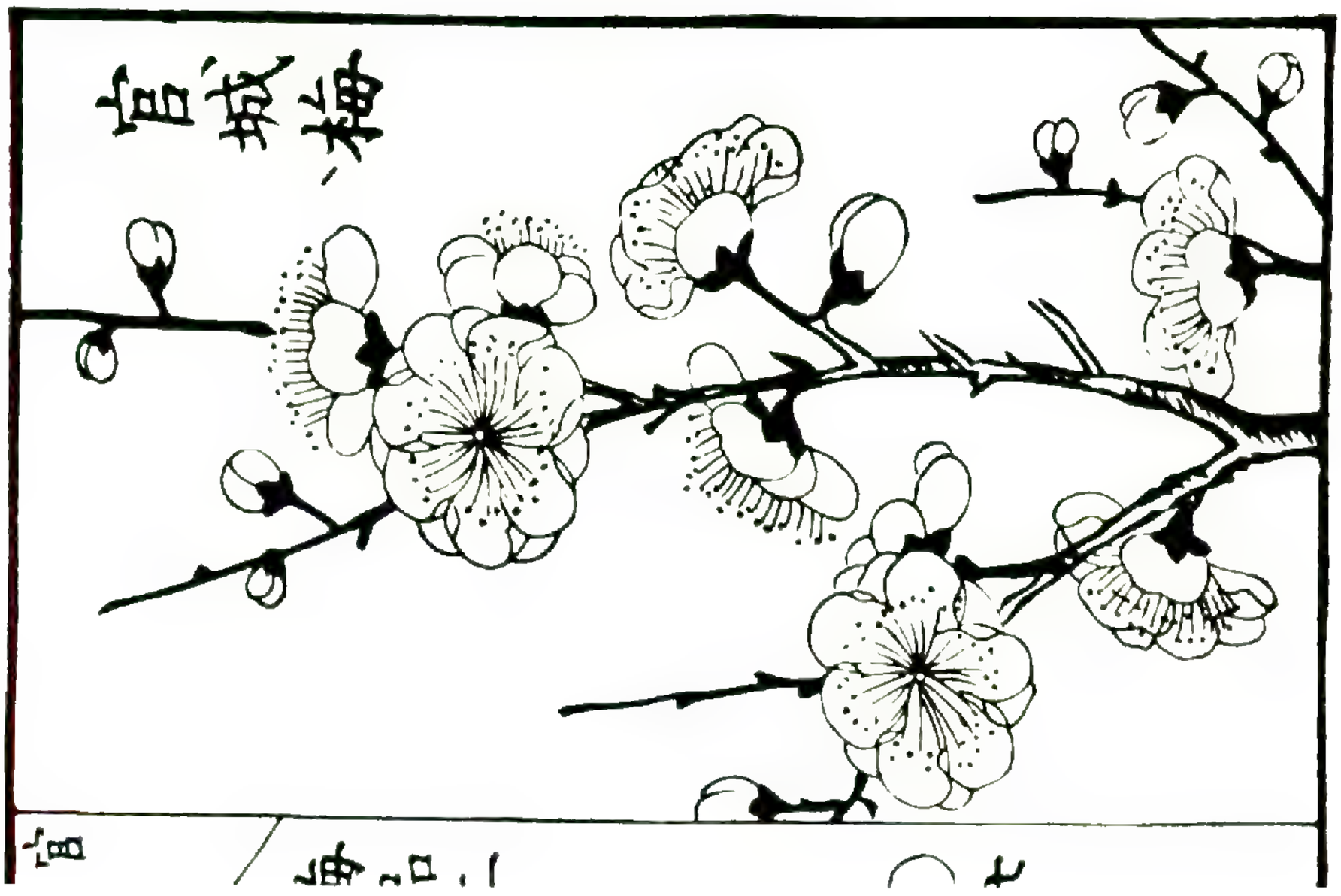


Fig. 33. The plum variety known as Gobai, Japanese name Hahiume, double-petaled and very fragrant, from Matsuoka Gentatsu's Baihin. There was a tree of this by the Kameido shrine in Edo. Matsuoka, whose usual pen-name was Igansai, gave not only the synonyms for each cultivated variety, but also indicated where a typical specimen could be seen.

Exhibit 38. Matsuoka Gentatsu, Igansai Ōhin (Igansai's cherry blossoms). 1 vol. Kyōto: publishers, Nakanishi Uhei and Andō Hachizaemon; Ōsaka (Asai Ryūshōdō), Hōreki 8 (1758).

This work illustrates in black and describes 69 varieties of sakura, flowering cherry. Included in the number, and at the end, are those varieties called sakura but really not such, and not classified. The prefaces extoll the loveliness of cherry blossoms.

Another edition: Matsuoka Gentatsu, Ōhin, Jo, Ge (Cherry blossoms, vols. I and II). 2 vols. Kyōto: distributor, Tanaka Jihei; Tōkyō, Ōkura Magobei; and Ōsaka, Matsumura Kyūbei, reprinted Meiji 24 (1891).

This edition, with identical text, has the figures in black, pink, green, yellow, yellow printed over pink (giving orange) and green printed over pink (giving a purplish gray).

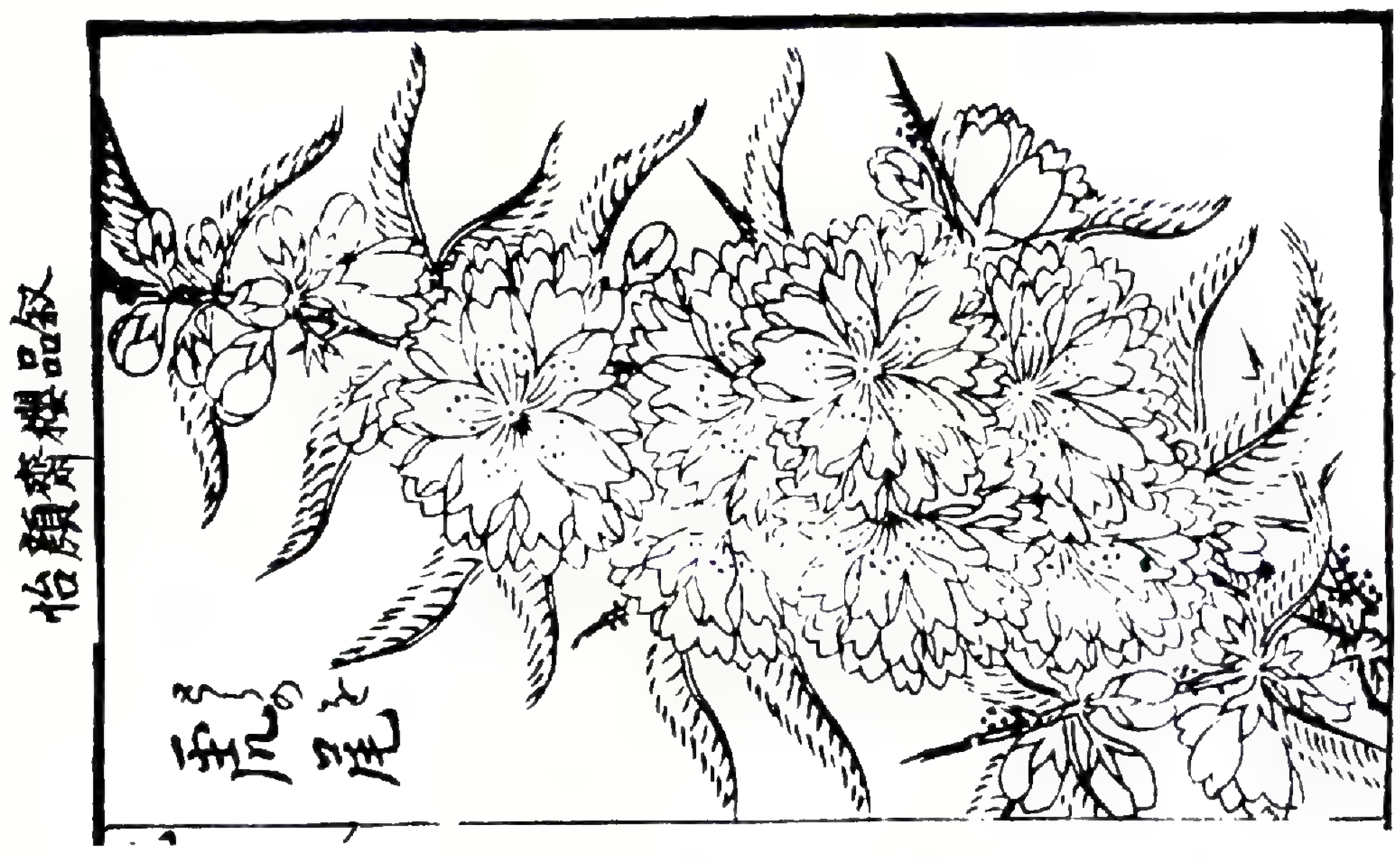


Fig. 34. A double variety of Prunus donarium Sieb. (var. hort. torano-o) from the 1758 Igansai Ōhin. The name means "tiger's tail." The variety is late-flowering and has "no twists or bends in its graceful branches."

Exhibit 39. Kōtendō-shujin (pseudonym: the "Master of Kōtendō"), Kadan Asagaotsū; Kan, Kon (Book of garden morning glories; Vol. I, II). 2 vols. Vol. 1, n. p.: printer, Kaen Book Store; Vol. 2, Edo: publisher, Yamashiro Sahei; Ōsaka: publisher, Izumimoto Hachibei, Takahashi Heisuke; artist, Mori Shunkei, Bunka 12 (1815).

This, according to Shirai, was the first of the books on morning-glories, although the second (next item) appeared in the same

year. In the two volumes there are 38 major names for groups of morning-glory varieties, with corresponding illustrations. There are also many tanka (poems of five-seven-five-seven-seven syllables) about morning glories. The appendix (in Vol. 1) tells how to grow these flowers for production of the largest possible corollas and how to tell from the sprouts of germinating seeds what the shapes and colors of the flowers will be.

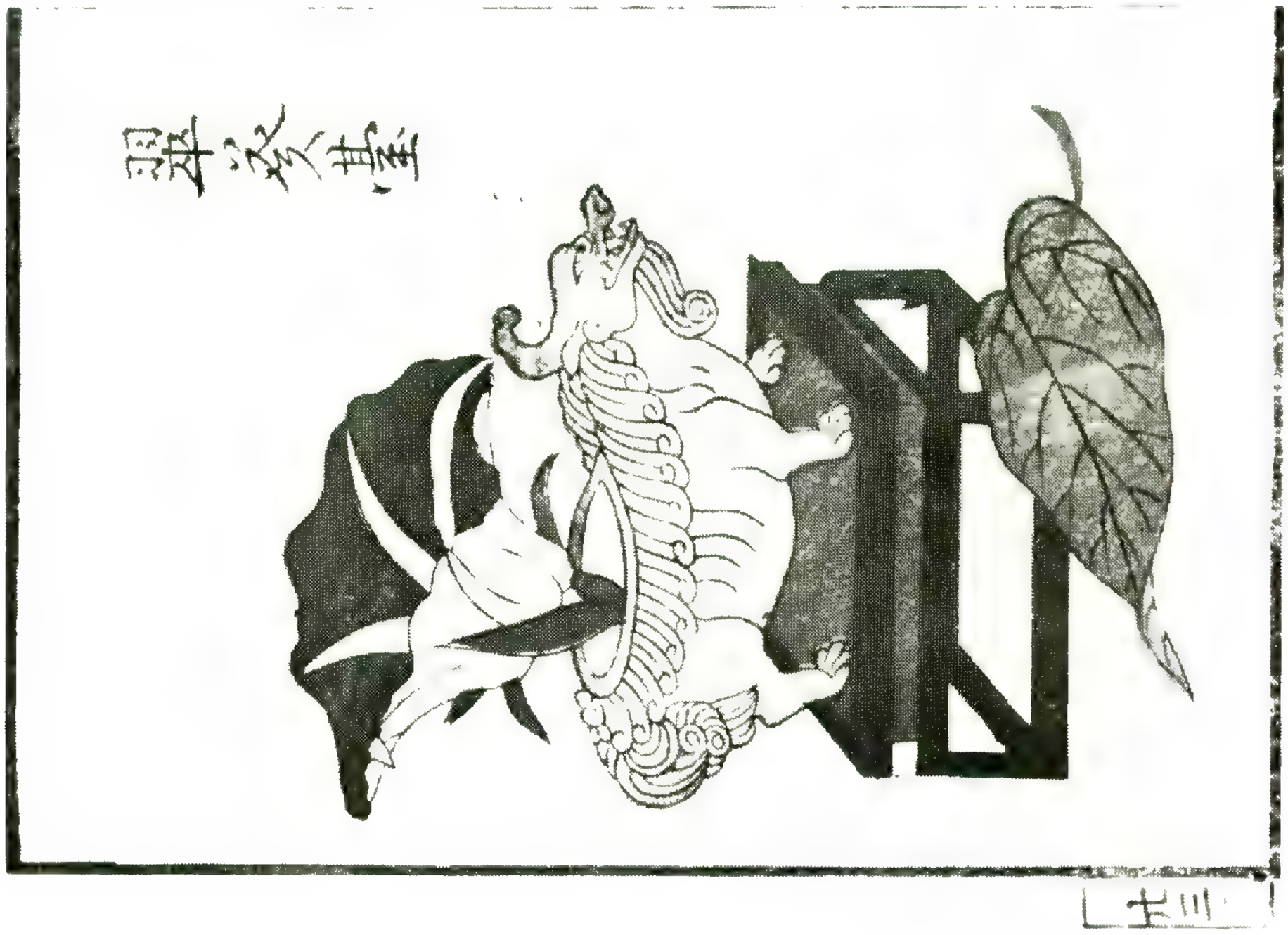


Fig. 35. The variety of Japanese morning-glory known as Suitōdai (blue-green aoi variety), one of the large types extremely expanded at the base of the corolla, chosen to show one of the quaint receptacles chosen for the exhibition of single flowers.

Exhibit 40. Minegishi Shōkichi, Kengohinrui-zukō, Zen (Illustrated study of morning-glories, complete). Illustrated by Niwa Tōkei. Ōsaka: copyright, Enkyodō; book stores, Kawachiya Hachibei, En'ya Heisuke, and Asadaya Seibei, Bunka 12 (1815).

The author states that which of several common names are used for the same one of the several hundred morning-glory varieties sometimes depends upon individual preference, and so he has coined suitable names for some, and has classified the 166 kinds included in his book under forty groups. By leaf shape he distinguished 5 groups, and by the flowers, 4 groups. Some of the rarer types, he tells us, produce flowers but do not fruit, and since they cannot be reproduced by seed, they can only be seen again, after being first exhibited and pictured, when they turn up anew as chance seedlings of seed-producing kinds. The varieties and groups are most easily recognized by comparing with

illustrations, which he presents.

Fig. 36. A representative variety or mutation of Ipomoea Nil (Pharbitis Nil) (Japanese morning-glory) of the group called by Minegishi Shōkichi the "Pheasant-like-flowered" (Kujakudai-zaki) varieties.

Exhibit 41. Minegishi Ryūfu (=Minegishi Tatsuo), Kengyūhin, Shohen (Morning-glories, first series). 1 vol. Naniwa (Ōsaka): publishers, Kōbundō, Kanseidō, Bunka 14 (1817).

A description of 24 varieties of morning-glories. Except for one picture in which the foliage is green, the illustrations are precise for form but not for color, being in black, varied by dilution or block-wiping to pale gray, and set off by pale to very pale pink. A second series seems to be indicated or announced by the title, but has not been seen.

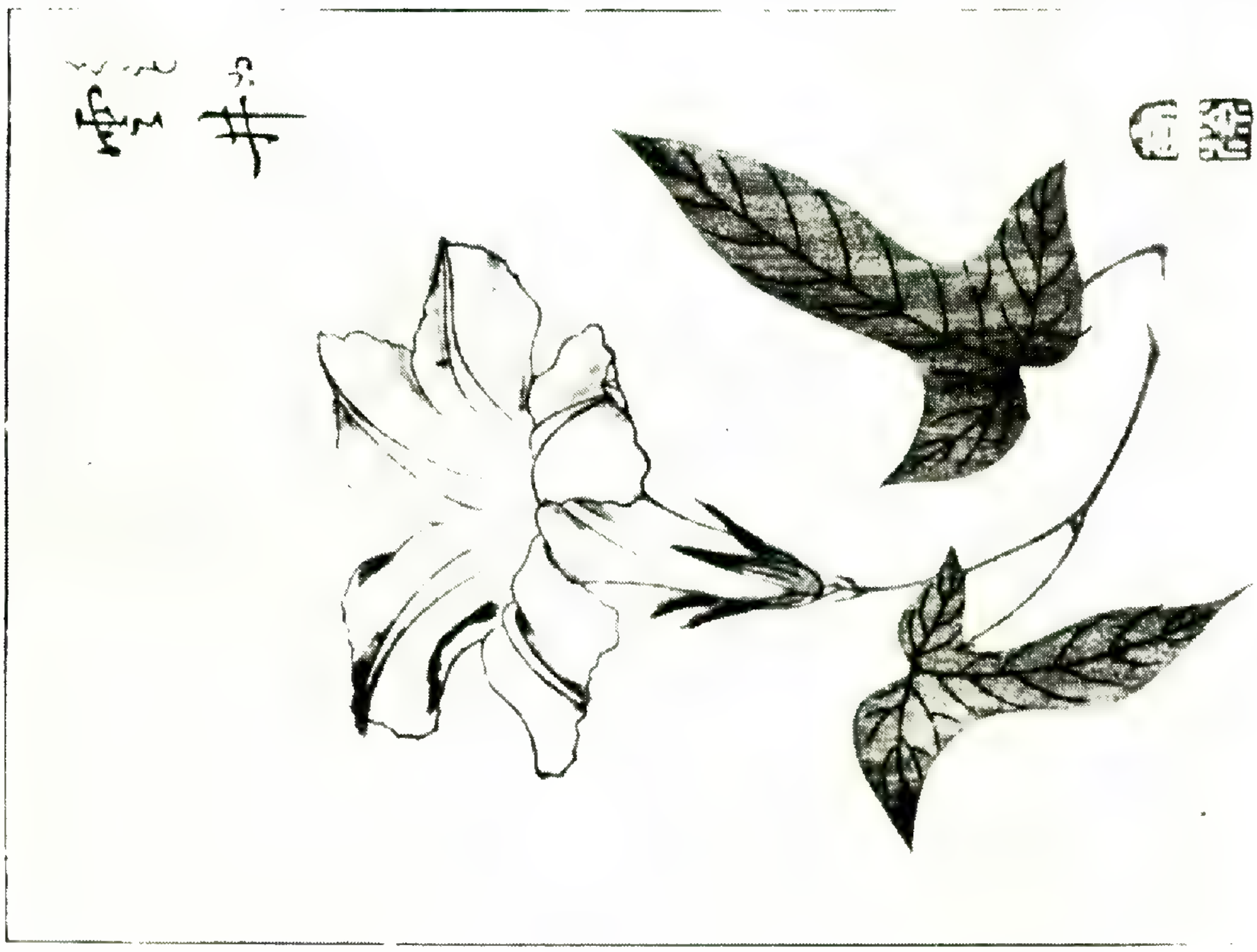


Fig. 37. A horticultural variety of Ipomoea (Pharbitis Nil) (Japanese morning-glory), var. hort. kumoi, a vague designation which may be thought to mean "heavenly." Reproduced from a picture in tones of black to pale gray, set off by pale red, and therefore one of the prints known as sumi-e.

Exhibit 42. Shūsui Charyō, Asagao Fu (Morning-glory pictures). 1 vol. Ōsaka, Izumimoto Hachibei, Takahashi Heisuke; Edo, Yamashiroya Sakei, Ōbaya Yashichi, Bunka 15 (1818).

The author tells us that morning-glories were mentioned as far back in Japanese literature as 750 A. D., in the Man'yōshū (Anthology of myriad leaves) and then in the Kokinshū (Ancient and modern poems) of the year 922 and in the Genji Monogatari (Tales of the Genji) of the 10th century.

Early morning-glories, he relates, were of the sorts with "round-shaped flowers," and the colors were robin-blue, white and dappled. In recent years, however, especially in the last 5 or 6 years, other kinds with different shapes of leaves and flowers increased in number and many rare ones appeared. Rich people have beautiful gardens in which to plant morning-glories extensively, but poor people cannot. So last year, for the first time, I held a meeting for the exhibition of morning-glories and gathered them from many places. I gave the first place to the most beautiful one, and I classified all into seven classes. Again

this year I have held such gatherings a few times and from among the newly exhibited specimens as well as from among those previously exhibited, I selected rare and unusual ones, and had a friend, Nōtansai, draw them. About 50 varieties I have in this book, and I shall display more in a later book. Colors are shown in the pictures only by the shades of blackness. It is difficult enough to show shapes of the flowers, but colors which are made by the Creator cannot be shown by drawing. So the colors are mentioned in writing with the illustrations.

朝顔譜

Fig. 38. Mutations of Pharbitis Nil (Japanese morning-glory). Left, var. hort. Itozakura (Thread-cherry) with linear, white corolla segments. Right, var. hort. Katahoko (One-bladed halberd).

Exhibit 43. Naritaya (i.e., proprietor Narita) Tomejirō, Asagao Zufu; Jō, Chū, Ge (Pictures of morning-glories; Vol. I, II, III). n. p. (Edo?), Ansei 4 (1857).

This work contains pictures of prize-winning morning-glories exhibited from 1854 to 1857, although the most conspicuous date Kaei 7 (1854), when the preface was written, appears in each of the two editions seen. (See next entry.) The following work is merely an expanded edition with the number of varieties illustrated increased from 174 to 194. The author's name was undoubtedly Narita, and the added "ya" indicates that he was the proprietor of an establishment which may have been a nursery or a publishing

house or both. He may have been a leader in the asagao (morning-glory) hobby who commercialized his interest by selling plants to amateurs and by publishing successive cumulated records of the most interesting plants shown at the exhibitions. Shirai (71) states that in Ansei 2 (1855) under the sponsorship of Narita Tomejirō an asagao-viewing party was held at Hōshintei in Tōkyō. After the meeting the participants recorded the varieties seen for printing.

Fig. 39. Mutations of Ipomoea (Pharbitis Nil) (Japanese morning-glory), from Naritaya, Asagao Zufu. On the right, var. hort. Aochirimen (blue chirimen-silk variety) with deeply (completely?) 5-cleft corolla, (not double, and stamens not transofrmed into petals) the segments narrow, laciniate, pale purple with blue stripes; leaves narrow, mottled, crinkled and twisted. Left, a double (apparently hose-in-hose) variety with segments deeply laciniate and entire, slate-blue; leaves of normal breadth, flat, acutely 5-parted, mottled, green, yellow-green and white. No Japanese name is given for this variety.

Exhibit 44. Naritaya (i.e., proprietor Narita) Tomejirō, Tohi Shūkyō (Autumn delight in towns and villages). 5 vols. n. p., Ansei 4 (1857).

Prize-winning morning-glories shown at exhibitions in Kyōto, Ōsaka, and Edo from 1854 to 1857. An expanded edition of the preceding. This work (and the entire group of asagao books of its period) are remarkable documents in the early literature of mutation and teratology.

Fig. 40a. Mutations of Ipomoea (Pharbitis Nil), Japanese morning-glory, from Vol. IV of Tohi Shūkyō. Left, variety with "dragon-shaped" leaves. Right, variety with "dragonfly-shaped" leaves. In the former the stamens are transformed and all the petals and

petaloid segments are somewhat lobulate, but not so excessively as in some other types which have numerous filiform divisions and may be described as narrowly laciniate. In the "dragon-leaved" variety the corolla segments appear to have become similar to the narrowed, divided, contorted leaf lobes, and the greatly hypertrophied stamens and carpels to have developed petaloid appendages.

Fig. 40b. Two additional pictures of morning-glory mutations from the Tohi Shūkyō. Left, a kind with purple and blue petaloid corolla divisions and greatly hypertrophied stamens with the anthers represented by petaloid structures; leaves chlorotic and white-mottled, as though infected with a virus. The total group

of reproduced pictures from the early asagao literature does not adequately represent even half of the range of variation of the Japanese morning-glory. The numerous types are morphologically so diverse that even if some of the deviation may be attributable to disease, it would seem that infection itself reveals hereditary differences. Plants of different genetic constitution may show different morphological reactions to infection, even if uninfected plants are similar in form. This hypothesis would seem worth experimental testing.

Exhibit 45. Inoue Gensuke (editor), Omoto Shasei Chūkai (One hundred pictures of Rhodea). 2 vols. Kyōto, published by the editor; distributors, Ueda Jinsuke and twelve others, Meiji 16 (1884).

A neat little work showing use in combination of wood-block printing with some sort of reproduction (lithographic?) from originals which seem to have been made by recess engraving on metal. In it are illustrated all of the traditionally cultivated chief types of omoto (Rhodea japonica) including the curious one with caudate-appendaged leaves.

Fig. 41. Mutations of omoto (Rhodea) showing (left) the variety Kinshi Kōryū (Striped like the strings of the 13-stringed koto, a musical instrument) and, right, the variety Nunomerasha (Wool-textured, this name referring to a kind of rough-textured woolen goods formerly imported through Portuguese or Dutch traders). The latter variety is described as having conspicuously thick, broad, reticulate leaves.

Exhibit 46. Kurimoto Hōan (Joun) and Shino Jōgorō, Mannensei Zufu (Pictures of omoto, Rhodea japonica). Tōkyō: copyright, Kōsha, Meiji 18 (1885). The authorship, as indicated, identifies this work from a bibliographic standpoint, although internal evidence indicates that the varieties of Rhodea may not have been chiefly "examined" by and "edited and published" by the two collaborators in the order in which their names are given.

萬年青圖譜

Fig. 42. The illustration, Rhodea japonica, in Japanese mannensei (ten-thousand-years green) or omoto, is a variety called nimenryū (two-faced dragon), silk print of 1885 from Kurimoto's Mannensei Zufu, exemplifies one of the less usual modes of reproduction. The use of gold on the pots suggests lithography. Examination with a lens discloses an appearance as though the flat shades of green had been printed typographically from blocks surfaced with very finely woven silk or other textile, or by lithography or an offset process simulating lithography. Cut-outs of silk cemented to a wooden surface that could be engraved, or to any surface that would not take lithographic ink might conceivably give a similar effect.

This work, from the standpoint of plant illustration, is of exceptional interest because of the use of gold and also because it seems to have been in part printed from silk. Later Japanese lithographic plates reproducing lacquer, bronzes, porcelain, etc., were successful in the representation of the metallic luster of gold-leaf, etc. Here the gold is used for the designs on the pots, and may have been printed from stone. This post-Meiji book is admitted here because of the subject matter and curious type of printing. The illustration is presented as a negative, since that gives a slight suggestion of the ornamentation of the pot, and the positive does not.

The author says that Rhodea always remains green as though it had remained unchanged for 10,000 years, hence the name mannensei which probably started in the Bunka period (1804-1817). He considered that there were only seven basic varieties, in spite of the great variation in size and color of the flowers, leaves, and fruit, and found that the variations of different parts were correlated. The taste of the western capital in varieties was a little different from that of Tōkyō, and he gave notes on the localities that produced superior ones.

Exhibit 47. Kimura Toshiatsu, Tachibana-hinrui (Study of Ardisia varieties). 1 vol. Ōsaka, Amaya Yohei, and Kyōto, Yoshida Shimbei, Kansei 9 (1797).

In the preface the author tells us that tachibana, more recently called karatachibana (Ardisia) can be so cultivated as to assume seven different forms. It is, he says, the smallest of all "trees," to be grown in a pot and admired for its flowers in spring and for the beauty of its inedible crimson fruit in summer. The name tachibana appears to be generally applied to a citrus fruit rather than to Ardisia.

Ardisia was one of the horticultural favorites which, according to Shirai, was greatly in vogue among Japanese amateurs

about the beginning of the 19th century. There is, however, only this one book exclusively on Ardisia in the collection.

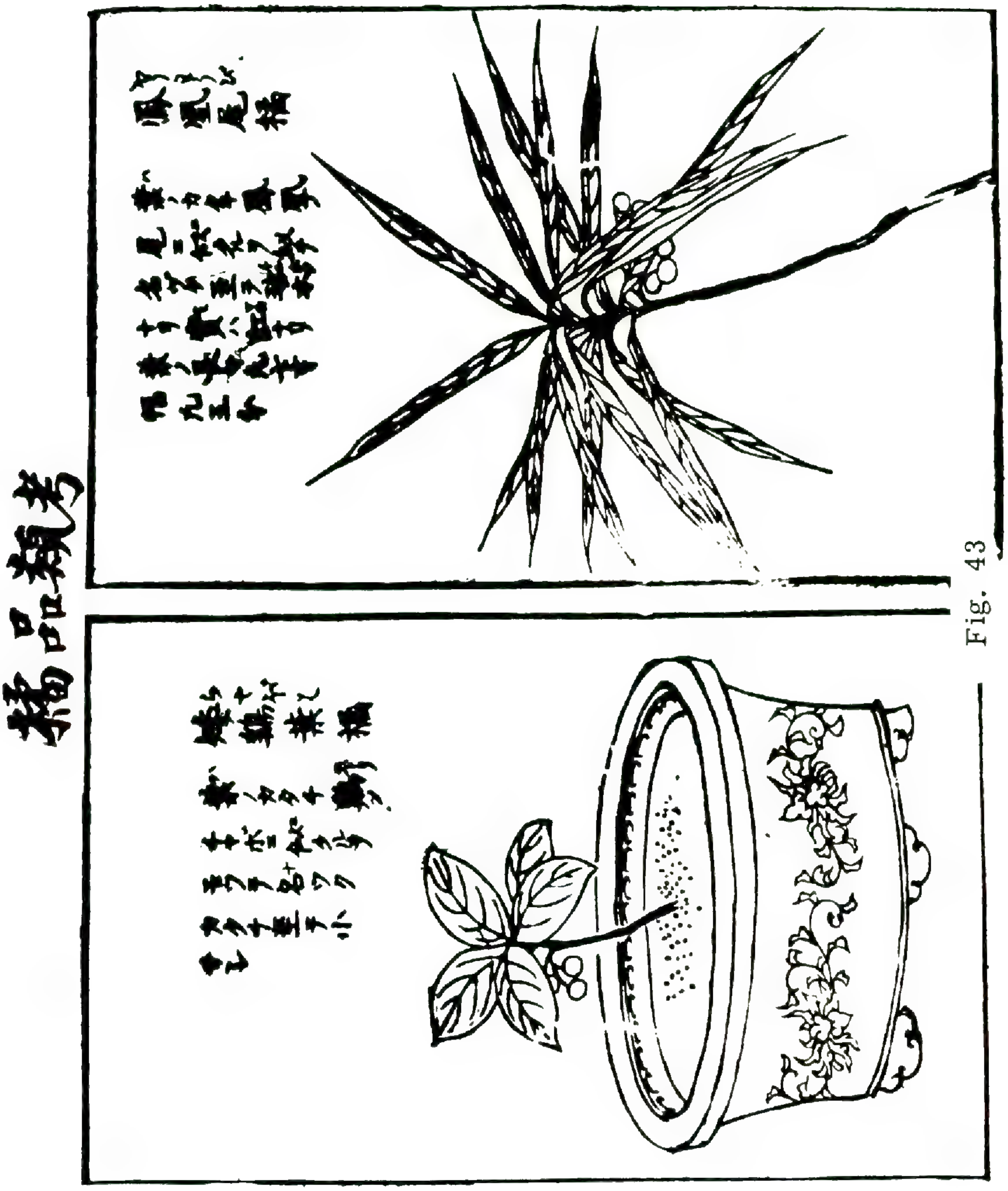


Fig. 43

Fig. 43. Woodcuts, from Kimura's Tachibana-hinrui, of two horticultural varieties of Ardisia hortorum, or Karatachibana, namely (left) var. hort. Chaboha Tachibana (Chick-leaf tachibana) and (right) the rare var. hort. Hōōbi Tachibana (Phoenix-tailed Ardisia) so called from its narrow elongated leaves.

Exhibit 48. Anon., Shōyōran Shū or Matsubaran Shū (Book of pine-leaf orchids). 1 vol. n. p., n. d., (pre-Meiji?). 51 double leaves.

The volume contains 94 water-color paintings, without pagination or text other than captions for 8 groups of varieties, given in seal characters, (for which the basis of classification does not appear) and also the names of the 94 varieties in plain kanji, without syllabic characters (katakana) to indicate names as spoken. The work was obviously prepared by some horticultural enthusiast, perhaps as a record of his own collection or of varieties brought together by the members of a society for exhibition.

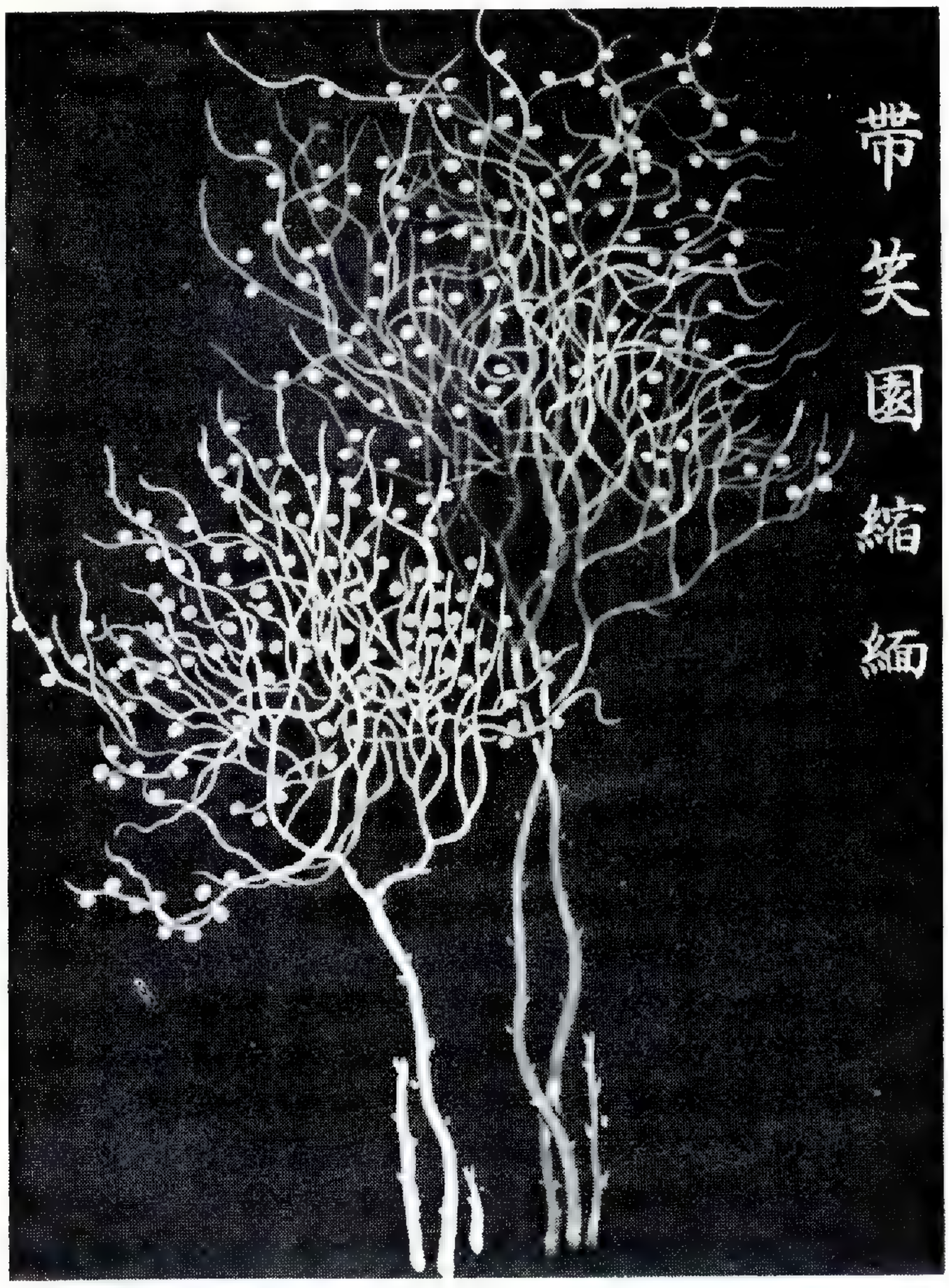


Fig. 44a

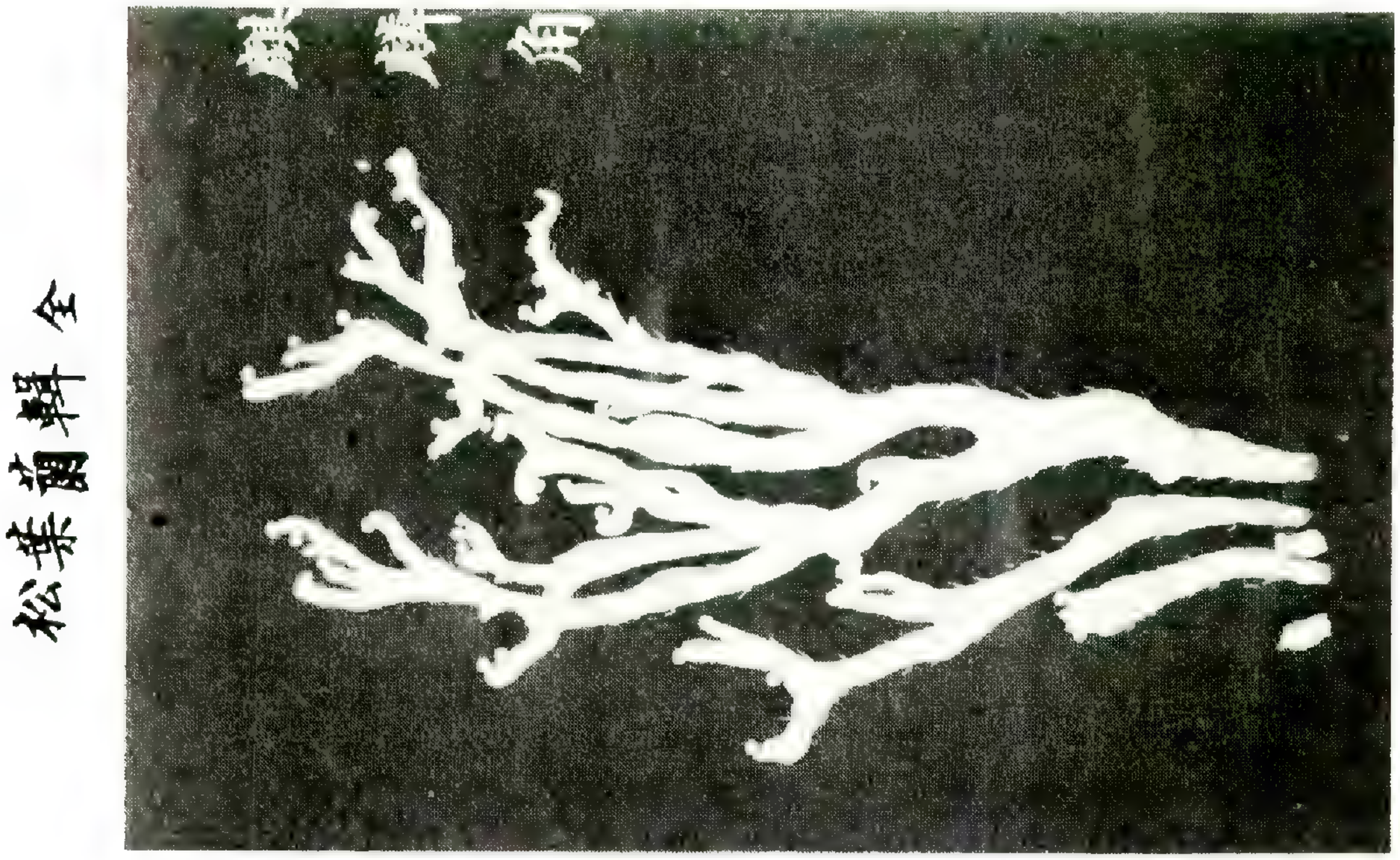


Fig. 44b

Fig. 44a, b. Psilotum triquetrum. Two presumably mutational types grown as horticultural varieties. Fig. a, var. hort. Taishōen Chirimen (Taishō-garden coarse-textured-silk); fig. b, var. hort. Kirintsuno (Giraffe-horn). The positive photostat of these illustrations does not convey the effect of the paintings as well as the negative, which we have therefore reproduced.

Exhibit 49. Chōseisha Shujin (pseudonym, "Master of Longevity House"), Matsubaran Fu (Album of pine-leaf orchids). 1 vol. n. p., Tempo 7 (1836).

The 59 figures for this work required four blocks for printing, in blue, pictures of blue-and-white porcelain pots of four designs, and one block only for representing soil, as gray. These provided the basis for all the different pictures. The plants and their names were printed from individual blocks for green, and, if there were sporangia, for yellow, regardless of overprinting of blue and gray by green, or of green by yellow.

The "pine-leaved orchids" were not orchids at all, but varieties of the fern-ally Psilotum triquetrum, belonging, according to the old Japanese classification, to the category "ran," which included orchids and some other plants entirely unrelated to orchids. Psilotum gave rise to a large number of mutations, the cultivation of which occupied the attention of a special group of horticultural enthusiasts.

松葉蘭譜

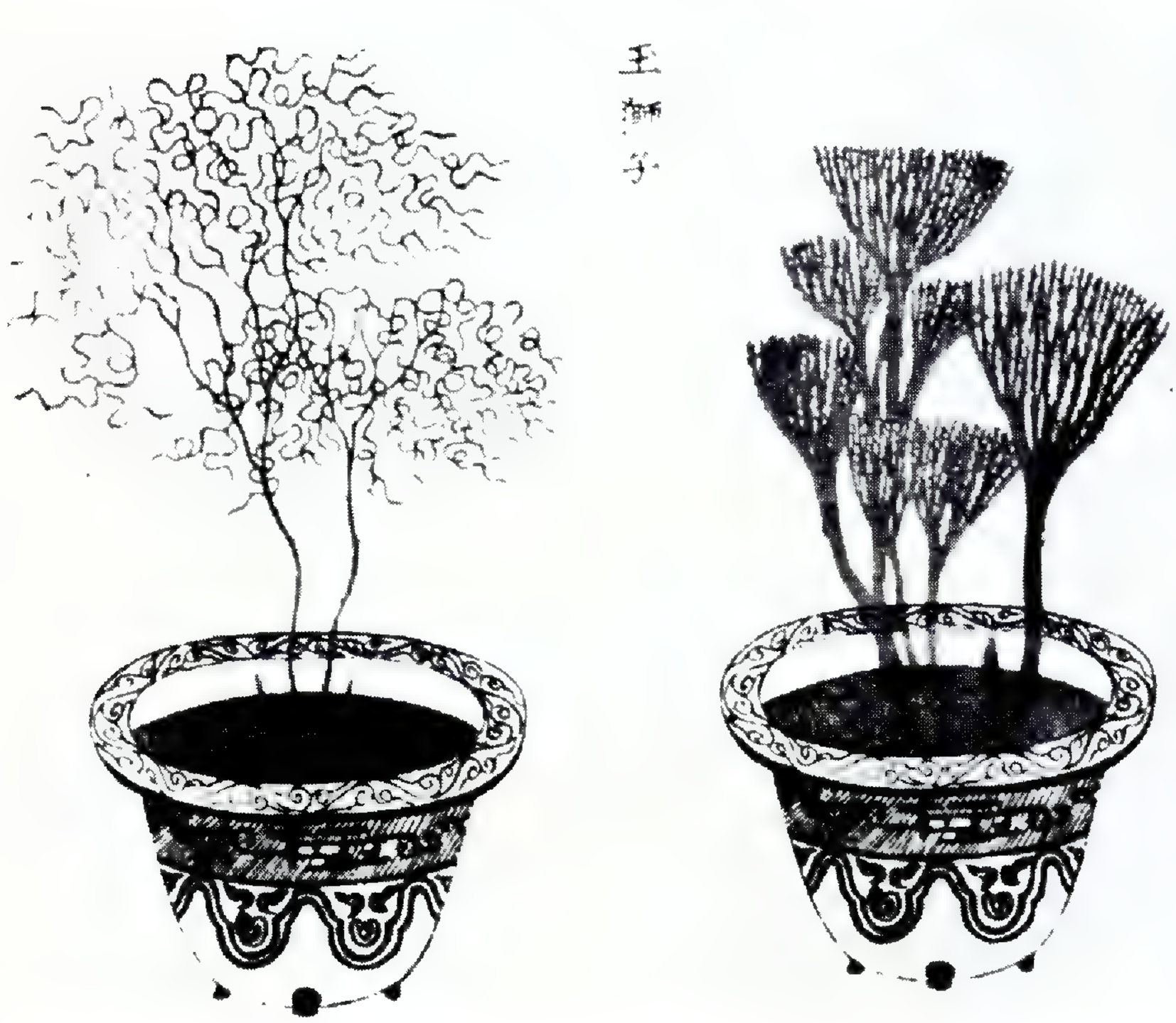


Fig. 45. Psilotum triquetrum. Two horticultural varieties: left, var. hort. Tamajishi (Bead-lion); right, var. hort. Kirinjishi (Giraffe-lion).

Exhibit 50. Anon., Fukujusō (Adonis). 1 vol., MS, 31 folded leaves with text and 46 water-color illustrations. Copied by an unknown hand in Meiji 36 (May 1903) from a copy made by Tanaka Yoshio in Meiji 23 (1900) from a booklet borrowed from Makita Kōtoku that had been shown in an exhibition of 2/9, Meiji 23 (1890).

This work of unknown authorship and date shows the remarkable variation in flower color and morphology which indicates that Adonis amurensis has produced a remarkable series of mutations in Japan and might be an excellent subject for studies in genetics and evolution, if the generations followed each other closely enough. The progenies would be large enough if the seeds were produced by identical perennial individuals propagated by division. They would be kept in pots and brought into flower as desired during cold weather by being brought indoors. Adonis (the Japanese fukujusō) was one of the specialties of horticulture which had a considerable vogue among amateurs who exhibited novel variations at the shows devoted to the specialties, for each of which there

was at least one of the Japanese botanists whose work bridged from the old to the new at the time of the restoration.

Exhibit 51. Kinta, gardener (editor), assisted by florist Genzō, Sōmoku Kihin Kagami (Collection of unusual plants, [with drawings and writings by many experts]). 3 vols. Edo, Bunsei 10 (1827).

A very remarkable work, similar in content and interest to the one by Mizuno Chūkyō (see next entry). Some of the figures are the same and indicate copying or taking from the same sources. The style of the drawing and wood-cutting is very similar in the two works, but the botanical content is largely different. The work of Kinta and Genzō has a good representation of Ardisia varieties, variegated conifers, fern allies, etc. It is interesting as an example of ukiyo-e folk science, for its authors proclaimed almost ostentatiously that they were of humble birth and occupation.

Fig. 46. Two pictures of Adonis (fukujusō) from the work of Kinta the gardener and Genzō the florist, showing varieties similar to those that interested Tanaka Yoshio so many years later. One has deeply fimbriate petals and the other shallowly multilobulate petals.

Exhibit 52. Mizuno Chūkyō (also: Mizuno Issai), Sōmoku Kin'yōshū (Collection of tree leaves). 7 vols. (Vols. I-VI + Appendix). Kyōto, Katsuura Jiemon; Ōsaka, Akitaya Taemon; Nagoya, Eirakuya Tōshirō; Edo, Yamashiroya Saebe, Suharaya Mohei, Bunsei 12 (1829). Artists: Ōoka Umpō and his disciple Sekine Untei.

Shirai pays Mizuno the high compliment of considering his work the best of the sort ever published in Japan. Some of the Japanese horticulturists were particularly concerned with plants which had variegated leaves, just as in this country and England down to 50 years ago amateurs maintained whole collections of "foliage plants." In Japan various chimaeras were prized which consisted in part of more or less albinotic or chlorotic tissue replacing the normal green. Apparently some of the variations may have been pathological rather than genetic, for they have the appearance having been caused by virus infections.

The author had the artists sketch plants repeatedly from life until they were skilled in showing the characteristics that were to be emphasized. The pictures are remarkable for their sharp contrasts, for green is represented by full black and any degree of albinism or chlorosis by the tint of the straw-colored paper. Scores of varieties are described and illustrated, ranging through ferns, conifers and flowering plants, some of which are still to be seen in Japanese collections. Not all are woody, as might be assumed from the title, for many are herbs. Old Japanese book titles are notoriously as vague as the names of their authors, who adopted new pen names whenever it struck their fancy to do so.

Fig. 47. A page of figures from Mizuno's Sōmoku Kin'yōshu, a treatise on variegated plants. At the right a green and white chimaera of Passiflora. At left, variegated Equiseta, suggesting the beginning of a feature which in the course of evolution has become morphologically segregated and stabilized in the fertile shoots of certain species (for example, Equisetum arvense) being chlorotic throughout, whereas the vegetative shoots are green.

Exhibit 53. Kuwagata Keisai, Keisai Ryakuga (Keisai's simplified pictures). 1 vol. Edo: copyright, The Kuwagata Family, n. d.

This little popular volume of humorous color sketches of everyday life gives a vivid picture of Edo about the beginning of the last century, and was one of the volumes which the artist (1761-1824) produced for working people. In late life "Keisai," who generally employed this or some other brush-name, entered the priesthood. He published pictures of plants in other books, but this one, entirely non-botanical, hardly touches even on horticulture except for the picture reproduced. Brown (12) says of the works of later date than 1795, most of them with "Ryakugwa" in the title, that "the technique has lost every trace of ukiyo-e influence and has become wholly impressionistic in style." This volume, undated, may be among the first of them.

蕙齋畧畫

Fig. 48. Arranging potted chrysanthemums for display. The great popularity of flower shows in Japan has been frequently remarked by visitors. Shelters to protect the tall fragile exhibition plants from the weather have remained typical of the Japanese chrysanthemum shows.

Exhibit 54. Shimizu Kanji, Kadan Yōgikushū (Cultivation of garden chrysanthemums). 3 vols. Kyōto: publishers, Taniguchi Shichizaemon and Uemura Shirōbei, Shōtoku 5 (1715).

花壇養菊集

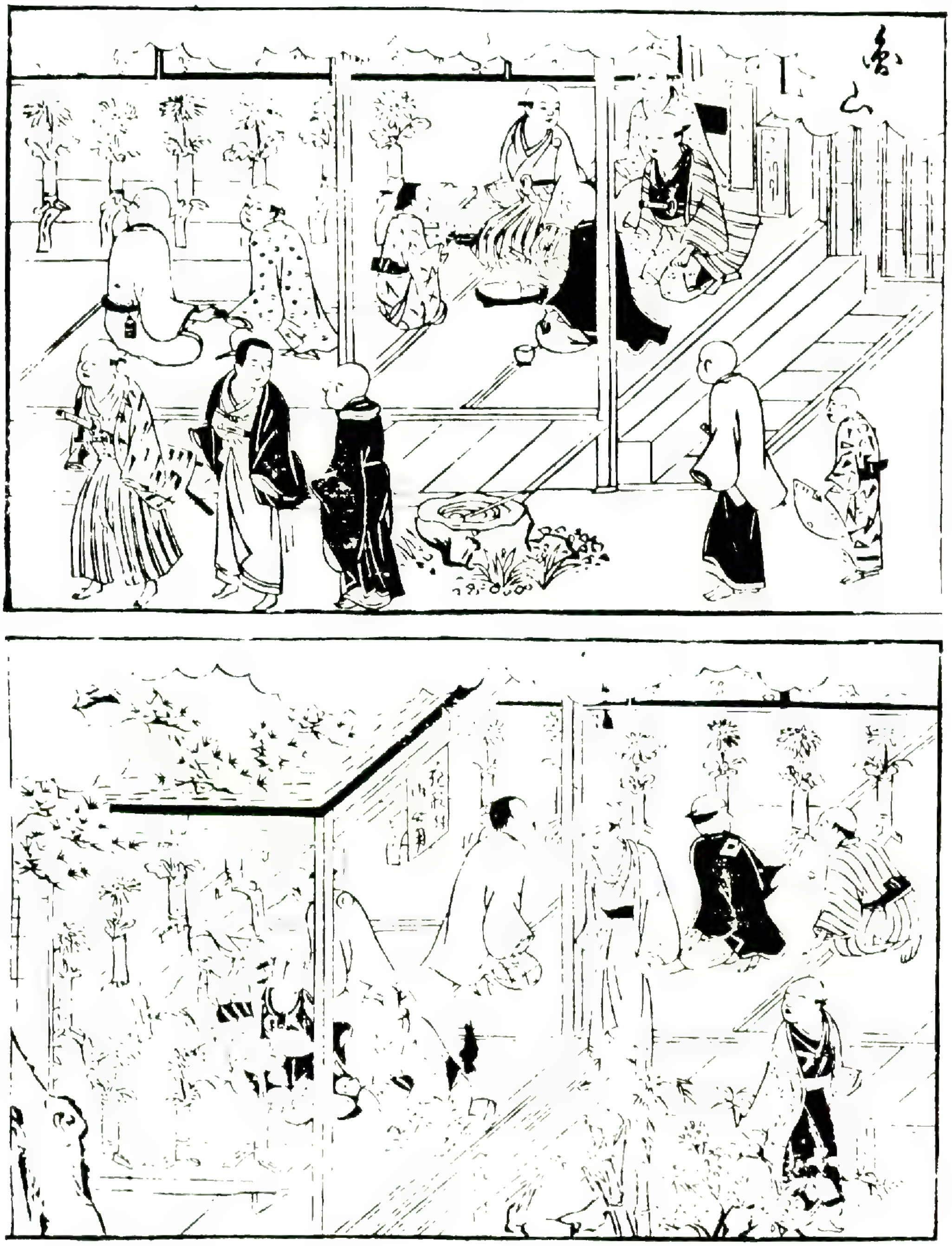


Fig. 49

Fig. 49. A picture of an early chrysanthemum show from the first part of Shimizu's work on the chrysanthemum. In the original the two halves of the picture go across two pages, so that the scene is continuous. To avoid excessive reduction we have had to place the halves one above the other, instead of side by side, but in order to follow the Japanese order of looking, from right to left, we have put the right-hand half above.

X. BOOKS ON GEOGRAPHY AND EXPLORATION (Exhibits 55 to 72)

(1) Famous Places Including Gardens of Incidental Botanical Interest

Exhibit 55. Hiroshige, Ehon Edo Miyage (Edo souvenir picture book). Vol. V only. Edo: copyright, Reikōdō; book stores, Suharaya Mohei and 11 others, n. d.

Interesting from the standpoint of printing on account of the small number of color blocks that were used, and the restricted range of color on each picture. All coloring is pale, except for one use of an intense blue. The pale reds vary to pink, pale blue to pale blue-green, and there is also use of pale green and gray. There is no yellow or purple or violet or brown, and no bright color at all except for bright blue on one print. The pictures are mostly of landscapes and historical sites in Edo and those of this volume have no direct botanical bearing, except as landscape always interests botanists and gardeners. Several illustrate parties visiting places of scenic beauty at cherry-viewing time.

Fig. 50. A crane as depicted by Hiroshige in the Ehon Edo Miyage.

Exhibit 56. Shiba Kōhan, Gazu Seiyū (Illustrated diary of a trip westward). 5 vols. Naniwa [Ōsaka]: publisher, Bunkindō; book store, Kōchiya Tasuki; Edo, Suharaya Mohei and 7 others; Kyōto, Yoshinoya Jimbei; Nagoya, Kōchiya Jinsuke, Kansei 2 (1790).

The publisher's advertisement of later books, dated Kyōwa 3 (1803), is pasted inside one of the covers.

This work is highly interesting from the standpoint of local topography, natural products, and marine animals, but has little botanical content, for the artist has shown only a couple of plants.

Among the considerable number of illustrations several deal with whales and whaling.

Fig. 51. Not mentioned in the text, is a picture of the American Opuntia (saboten) in flower. The flower color is indicated as dark orange. This illustration is adjacent to the description of Sunfu town, westward from Mount Fuji, as though it pertained to that locality.

Exhibit 57. Morishima Chūryō, Bankoku Shinwa; Kanshu, Ni, San, Shi, Matsu (Stories of Asian Lands; I, II, III, IV, V). 5 vols. Ōsaka: publishers, Meirindō and Sekishokan, having joint copyright; book stores, En'ya Uhei and Kawauchiya Shinjirō, Kansei 12 (1800).

The prefatory volume subtitled "Kanshu" contains prefaces and a table of contents for four other volumes which were to have been I to IV, of which it must have been decided to omit the material of Vol. I, which volume as planned is not in the set. Inside, however, it is indicated that prefatory "Kanshu" is I, and the stories begin in Vol. II. Vol. V is not accounted for by the table of contents, but the publishers' pasted leaf inside the prefatory volume indicates that there should be 5 volumes, as there actually are.

The author states that in addition to the original three continents, Asia, Africa, Europe, there was the more recently developed America, but that he confines his work to Asia, and even omits the superior parts of that continent, namely, China and Japan; as well as Korea and other well known places.

Among the stories are some of botanical or anthropological interest, and Vol. III, dealing with Asiatic Islands, has a legend of Philippine interest, which appears to refer to the Batanes Islands, and suggests that etymologically the place names Batan (island south of Formosa) and Bataan (across the bay from Manila) may both have had the same origin, and have meant "place of Bata' [or Batak]," i.e., place of aboriginal people. The story is entitled "Ship-wrecked Bataan people came to Japan," and runs about as follows:

Bataan is an island south of Taien [Taiwan?] and near Tenjiku (India). In Empō (17 May 1680) a foreign boat reached Hyūga Province (in Kyūshū). The feudal lord sent them to Nagasaki, and Ushigome who was the administrative head of Nagasaki stored the boat in a temple, and housed the people in a shack. All available persons including the Dutch failed to understand their language. A skilful man named Mizuno filled a tank with water, made boats with bamboo leaves and placed in them mud-made dolls. He also put pebbles to indicate islands. By and by they understood and arranged the pebbles in the water, made a sea route, and it was understood that they came from Bataan. Their names and their ages were listed in katakana. Some were indicated as deceased. [Probably they had died before they reached Japan.] Some were black; some yellow; some bald; height 5 shaku and 5 or 6 sun. They were wearing what looked like the Japanese furoshiki [a cloth used to carry things in] which our author thought might be the saron worn in India [i.e., the Malay sarong]. They were wearing swords made in Kara. [Kara usually meant China, sometimes

just foreign countries.] Words like tabako and kiseru (pipe) were the same as Japanese. They sowed corn (morokoshi) seeds in June and got a crop in September. They climbed trees like monkeys and swam like cormorants. Those who died were buried at Sōfuku temple, and at length only 6 were left. The Administration directed the Dutch to take the Bataan people back home and in September when a ship sailed they went aboard. They did not go home. They landed at Karappa, capital of Java. [Miyako may mean here not capital, just a city. The substitution of r for l which is usual in Japanese pronunciation of foreign words would make this place name out of kalapa, "coconut." There was actually an important port of Kalapa in West Java which degenerated into an insignificant village.] They married and settled. Their boat (the one they were ship-wrecked in) was sold by the government.

The Japanese author then mentions that this story had appeared in Stories of Nagasaki by Nishikawa, but that he added what was omitted according to information from Ōtsuki Gentaku. The whole story he had narrated in his Kaigai Ibun (Strange Stories of Foreign Countries). He then recounts another story of Bataan: about Killing Old People.

In Bataan they kill old people who are no more useful, even if they are one's own parents. But there are also people who have plenty of food (imogashira, sweet potatoes) and feed old people. There they do not have rice and grains but they use imo (sweet potatoes) for food. Since they are barbarians and do not even know god, they do not have funerals and weddings. They bury corpses by vegetable gardens. This account is based on the observations of a man named Magoemon who spent some time in Bataan after he had been ship-wrecked, and escaped with the help of some Chinese in Kambun 8 (1668). The author had also narrated this story in Kaigai Ibunki (Strange Stories of Foreign Countries).

Another story of Bataan is about Houses.

The house is usually 9 shaku (feet); the beam is 2 ken (fathoms). Height 3 shaku, so people have to crawl in and out. This is because the wind from the sea is strong. They don't let callers into the house. They sit on stones at the entrance to the house, and they serve food there. They don't use nails in building; use bark to tie the parts; roofs are thatched; tree trunks are arranged for the floor on which there is no covering. Even their winter is about like March of Japan, so the people are almost naked.

Fig. 52a. Picture of a Bataan man, according to Morishima. The tags on the ear lobes of the ship-wrecked Bataan people gave their numbers for identification at the Tateyama Office as they were registered. The holes in their ear lobes were already there. The man holds in his hand what may be a coconut, reproduced from a figure of Clusius, but far too small.

萬國新話

Fig. 52b. A banyan tree of India, after Morishima. That this author drew upon many sources for his stories is shown by this picture (one of two or three which are of European origin) which appeared first in the rare little pamphlet in which the Belgian botanist Clusius published the descriptions of plant products picked up by Sir Francis Drake's sailors during their circumnavigation. Later it reappeared in the Plantae Exoticae.

Exhibit 58. Kikugawa Eizan, Nihon Kakuchi Meishō Zue (Pictures of celebrated places throughout Japan). n. p., n. d. (before 1829?). A series of 12 double-page trimmed and mounted colored illustrations, which were printed as separate left and right halves, and probably originally issued in regular sewed book form, but have been trimmed at the sides and rebound in accordion format. One of the prints is a view of Nikkō. The brief text may contain one of the first allusions to Japanese alpine plants. It is related that during the reign of Empress Shōtoku (the 48th ruler, 765-769 A.D.) the priest Shōju could not reach the top of the mountain range from Nikkō because the snow was too deep, but he was successful in his second attempt. The unfamiliar and peculiar plants seemed out of this world! There are maps of the two hemispheres, a map of Japan, and a curious map of Mount Fuji.

The artist, Kikugawa Eizan (1787-1867), studied ukiyo-e (popular) art under his father. He worked mostly in the style of Hokusai, but also imitated Utamaro in his portraits of noted beauties (bijinga) and made portraits of actors.

Fig. 53. Radial panorama of Fujiyama, as it would be seen if viewed along radii centering at the summit by one travelling around the mountain. (Look at it while turning the picture completely around!)

Exhibit 59. Ichiji Teikei, Okinawashi (History of Okinawa). 5 vols. Book stores: Tōkyō, Ishidawa Jikei; Kyōto, Fuju Sambei; Ōsaka, Tanaka Kyūbei, n. d. [after Meiji 9 (1874)].

The author visited Ryūkyū four times, and based his statements about land, products, manners and customs upon his own observations. Vol. I deals with geography and contains 14 maps and topographic sketches, which look like copper-plate engravings or lithographic reproductions of such. Vol. II deals with natural products, and has well executed copper-plate engravings of some of the more distinctive plants, a snake, fish, and a crustacean; also of an old tomb of a picturesque Chinese type in the side of a low hill. Vol. III deals with traditions and ancient history. Vols. IV and V bring the history down to 1874, when the Ryūkyūs came under the control of the Japanese Department of the Interior, and Ryūkyū officials took up residence in Tōkyō.

沖繩志

Fig. a

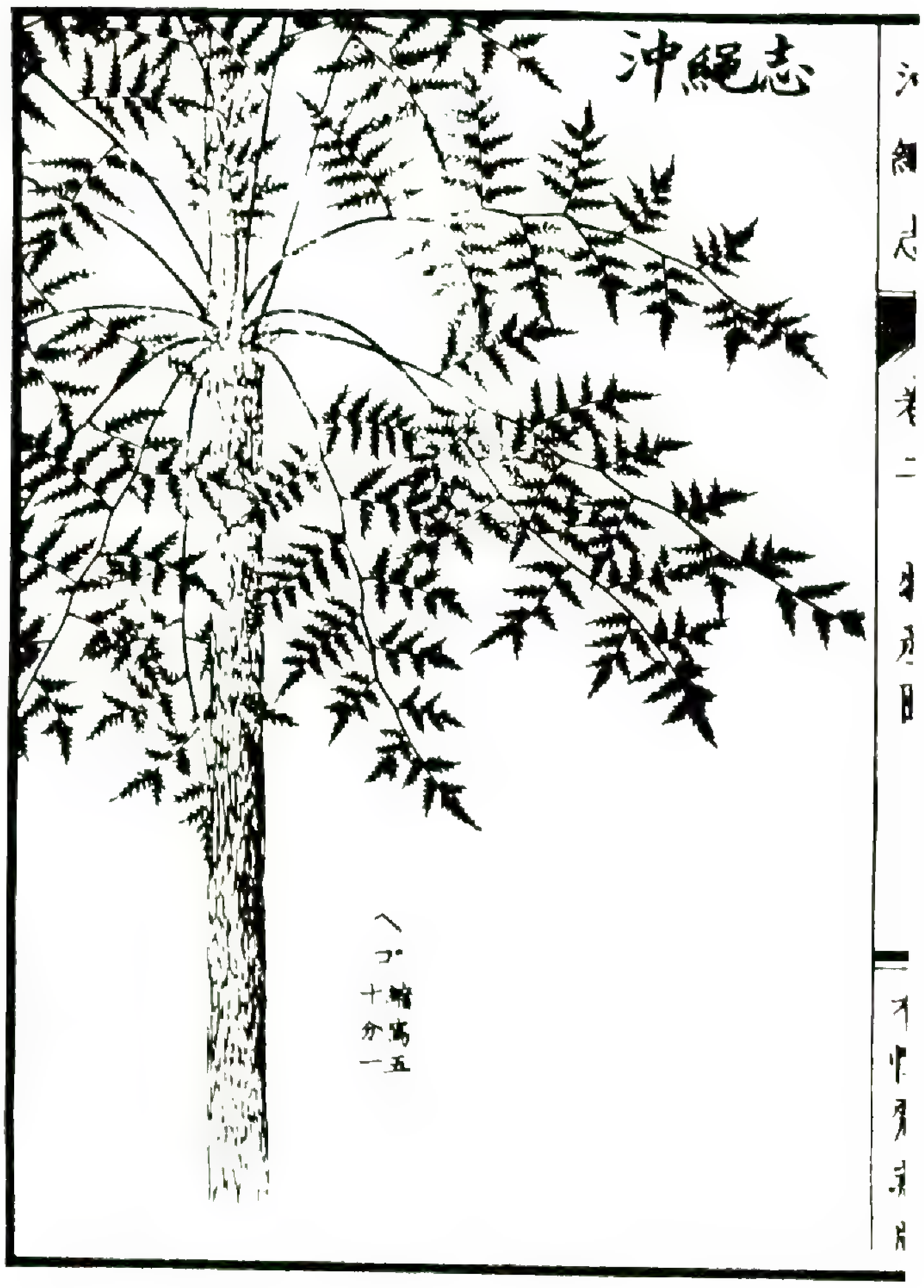


Fig. b

Fig. 54a, b. Fig. a, Okinawan Pandanus; fig. b, Okinawan tree fern. Figures a and b are both examples of characteristically tropical plants known to the Japanese from the subtropical Ryūkyū Islands. Another is the revolute-leaved cycad (Cycas revoluta) of which an old Japanese picture is reproduced in another connection.

(2) Exploration of Hokkaidō and northward; the Ainu

Exhibit 60. Ōuchi Dōsai, Higashi Ezo Yobanashi (Stories told by night about eastern Ezo). 3 vols. Edo: book store, Edo Bun'enkaku, Bunkyū 1 (1861).

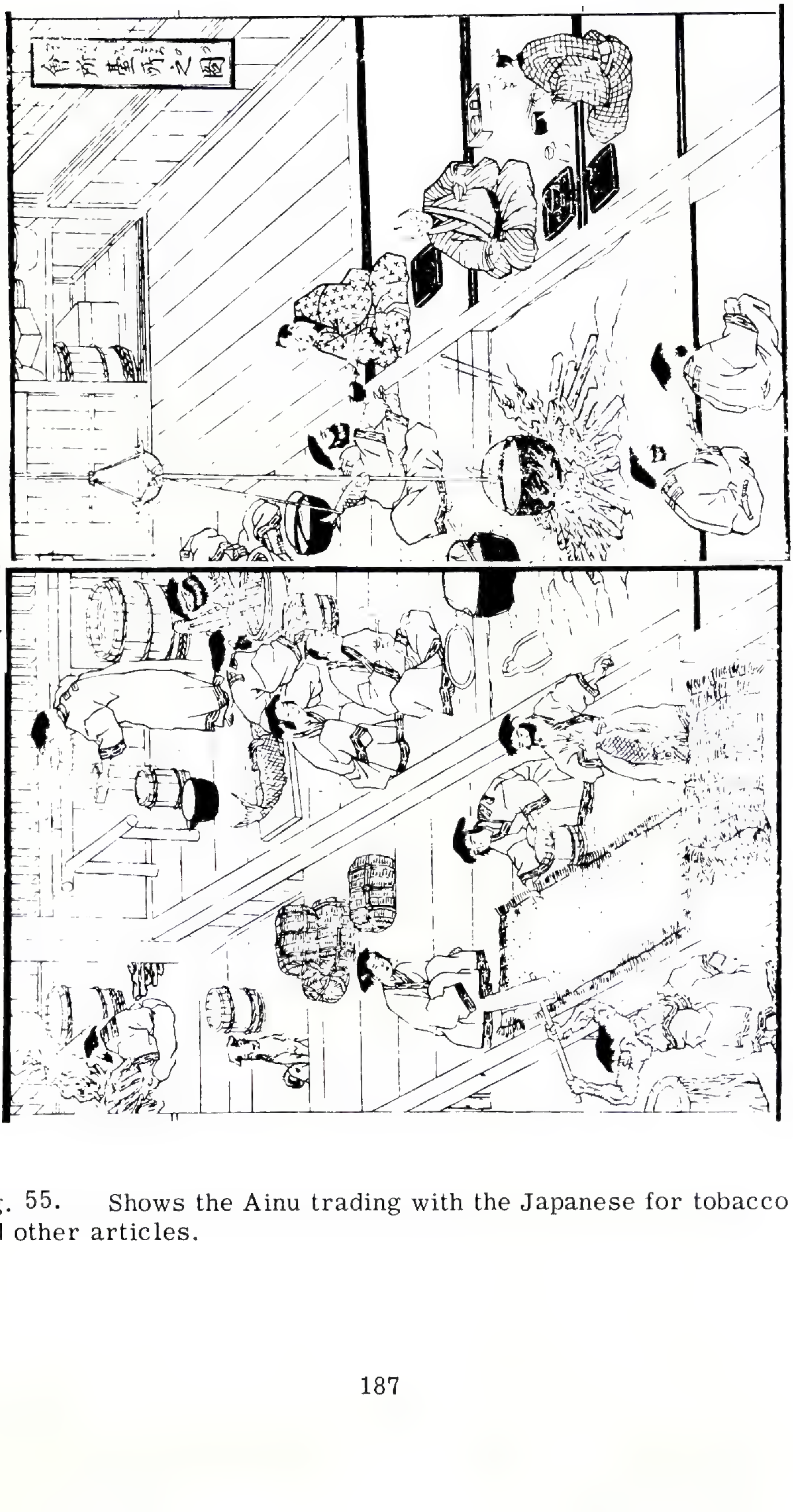


Fig. 55. Shows the Ainu trading with the Japanese for tobacco and other articles.

Exhibit 61. Kitajima Chōshirō, Honchō Ōko Enkaku Zusetsu (Illustrated treatise on the development of Japan). 1 vol. Edo: publisher, Hanshōken, Bunka 12 (1815).

This interesting work consists of a series of maps and descriptions of the political divisions of Japan from 1184 A.D. through the period of warring clans down to the time of administrative unification of the more southern parts of the country in 1615. It is of course completely non-botanical, but nevertheless important to one interested in any phase of Japan's cultural development, since it was political unification and long uninterrupted peace which gave an opportunity, through more than two centuries, for several such developments to take place as a nationally distinctive botany and horticulture, closely related to a still more distinctive popular art. The series of maps is also important in indicating the slow growth of Japanese interest in the North, for down to 1615 there was still incomplete knowledge of Hokkaidō, the Kuriles, and Sakhalin (Karafuto). This was reflected in the later history of Japan's attention to the geography, general natural history and ethnology of its northern territories, of which the literary record is well shown in the following section.

The ninth of the eleven maps and descriptions of Japan at various dates by Kitajima Chōshirō shows the Japan of 1682 (Fig. 56), and is the last which shows a part of northern Honshū as unadministered, although mapped. It was of course still much later that Hokkaidō was effectively occupied and controlled, during a period of danger from the gradual encroachment upon Asia of the Russian bear, who has now extended his domain to everything north of Hokkaidō. It is curious that, except for the Japanese, the Asiatics have so little applied their slogan of "Asia for the Asiatics" to the most territorially devouring as well as culturally and ethnically annihilating of all European intruders.

Fig. 56

Exhibit 62. [Murakami Aoki], Ezo Kikan (Strange sights of Ezo). Artist, Nankei. MS. n. p., 3 rolls, n. d., but ca. 1798-1801.

This long manuscript (referred to on p. 486) contains many water colors of Ainu scenes, with considerable text. One wonders if Artist Nankei may have been not only the painter but also the author of this work. Another manuscript in this collection contains copies of the same paintings with an introduction signed "Watanabe." A late printed edition edited by Ishikawa Kosai (1899) indicates no author. Shirai ascribes the work to Murakami Aoki. Could Nankei have been a pseudonym? It would seem probable, from Siebold's remarks, that Nankei (whose complete name has not been found) may have made duplicates of his manuscript,

or that others did so. The pictures are extraordinarily interesting from the standpoint of Ainu ethnology.

Fig. 57. Ainu of Hokkaidō (Ezo) gathering kelp (Laminaria), the large sea-weed which was one of the chief natural products that they exchanged with Japanese traders for imported goods, such as tobacco. The picture shows a diver cutting the kelp and tying it to a cord, to be pulled up by his companion in the boat.

Exhibit 63. [Murakami Aoki], preface by Watanabe, Ezotō Kikan Zukai (Strange Ezo sights described). MS. n. p., n. d., ca. 1800. 1 vol., 27 double or single page watercolor sketches with text and introduction, the latter signed "Watanabe." "Accordion" format.

The illustrations in this manuscript are largely duplicates of those in the preceding, but this selection includes fewer pictures than a single roll of the other, differently arranged. Since the rolls were made up by mounting pictures of varying sizes, some of which were trimmed, whereas this manuscript is uniform, it seems likely that the former by the artist Nankei is older, and the latter, with preface by an unidentified Watanabe, is a copy.

Fig. 58. Above. Ainu of northwestern Hokkaidō playing a 5-stringed musical instrument, to the accompaniment of which about 30 songs were sung, about falling water in the mountains, hot springs, hunting whales, etc. The plant shown on the left is the

one from which the strings of the lute are made. Called mosekina, which would be a kind of a nettle, it may be Urtica Thunbergii, which has the dictionary name mosekusa. Below. The picture of the bear-offering ceremony of the Ainu, simplified in a late printed edition of 1899 by omission of the skulls of the formerly sacrificed bears.

Exhibit 64. [Murakami Aoki] and Ishikawa Kōsai (editor), Ezo Miyage: Ezotō Kikan gemmei (Souvenirs from Ezo: original title, Ezotō Kikan, Strange sights of Ezo Island). 2 vols. n. p., Meiji 32 (1899).

Ishikawa's foreword said that he, the editor, did not know who was the author of this book but according to rumor it was by a member of the Matsumae clan who made a trip to Ezo in the Kyōwa period, and whose manuscript, entitled Ezutō Kikan (of about 1801) had been copied several times since. Shirai (71) said it was written by Murakami Aoki in Kansei 10 (1798). An unsigned note inside the front cover says that according to an exhibit in Hokkaidō, at the Institute of History, Murakami's work was Ezotō Kikan (Strange sights of Ezo) of Kansei 11 (1799). These volumes of 1899 are a printed edition of part of the manuscript in 3 rolls which is also exhibited. The printed version has a section on animals which is missing from the rolls.

Fig. 59. An illustration from the printed Ezo Miyage showing the Ainu ceremony of offering the sacrificial bear to the gods before the feast. It would be interesting to identify the ceremonial plants shown at the front of the temporary altar at the ends of the side fences. The chief ceremonial or ritualistic use of a plant among the Ainu was the invariable use in connection with their offerings to the gods of willow wands with attached shavings, the equivalent of the Japanese inau, which are to be seen in the sacred place at the background of the altar, as well as stuck into the sacrificed bear.

Exhibit 65. Fujii Tashirō, Ezo Jimbutsu Shi (Ezo people illustrated). MS. n. p., n. d., ca. 1830 (?). 15 double page and single page watercolor illustrations or groups of illustrations pertaining to the Ainu. There is a MS with the same title, supposed to date from about 1830, in the British Museum, which also has 15 pictures. The same work may have been printed about 1830 as Ezo Jimbutsu Zusetsu. (See Charles E. Tuttle Co., Cat. 280, no. 588, Rutland, Vermont, 1953.)

蝦夷人物志

Fig. 60. Ainu woman suckling a bear cub, tenderly cared for when little but destined when full grown, to be tormented, strangled and offered to the gods in the strange sacrificial rite preceding the bear feast. Its skull, surrounded by whittled willow sticks

ornamented with undetached shavings (inau), together with the older skulls of its predecessors, would be reverenced in the sacred place outside the east end of the house. A bear feast was one of the great religious ceremonies of the Ainu, the others being the house-warming feast and the funeral feast. It has been denied (see Batchelor, [4], p. 172) that the custom of women nursing the cubs ever existed among the Ainu in connection with their rearing of sacrificial bears, but this old manuscript testifies that it did. Even Batchelor says that the nuisance of a newly captured cub crying for its mother was "soon cured, for the owner of the cub takes it to his bosom and allows it to sleep with him for a few nights, thus dispelling its fears and loneliness." It was fed at first with millet porridge, "a mouthful of which is taken by a man or woman, and the cub allowed to suck it from the lips, which it will readily do ... However, it is possible that a woman may have been found strong-minded enough to take a very young cub ... to her breast ... but I have never seen one nursed by a woman."

Exhibit 66. Mamiya Rinzō (narrator) and Hata Sadayuki (writer), Kita Ezo Zusetsu (North Ezo illustrated). 4 vols. Edo, Ansei 2 (1855). 1st and 4th maki illustrated by Hashimoto Gyokuransai; 2nd and 3rd by Shigeta Tansai. Copies also at Leiden (Serrurier, Cat. No. 209) and British Museum.

Fig. 61a

Fig. 61a. Illustration from Kita Ezo Zusetsu showing non-Ainu natives about to knock out the teeth of a captive bear, bound to a log frame with its mouth pried open by a cross-bar (Vol. III, leaves 17-18). Some influence of the Ainu bear cult evidently extended to non-Ainu natives of Karafuto. This picture would partly illustrate the procedure described by Batchelor (except for knocking out the teeth) that preceded the strangling of a bear by the Ainu before the sacrificial feast.

"North Ezo" (Kita Ezo) was our Japanese author's designation for Sakhalin or Karafuto, where the Ainu came in contact with tribes (whom he calls Rarokko and Sumerenkuru) whose affinity was Siberian and who actually maintained contacts with the mainland. Mamiya described their ceremonies of coming of age, marriage, death, and ancestor worship.

Fig. 61b. These people used short ski-like snowshoes. Since the use of snowshoes was perhaps restricted to the non-Ainu tribes and may indicate that the Ainu of Sakhalin were from southward in Japan, whence they were only relatively recently pushed to the

northward, we introduce the illustrations of snowshoes in Sakhalin, as used by the Rarokko and Sumerenkuru.

Barbarian tribesman of the interior of Sakhalin travelling on snowshoes over what appears to be thinly snow-covered tundra.

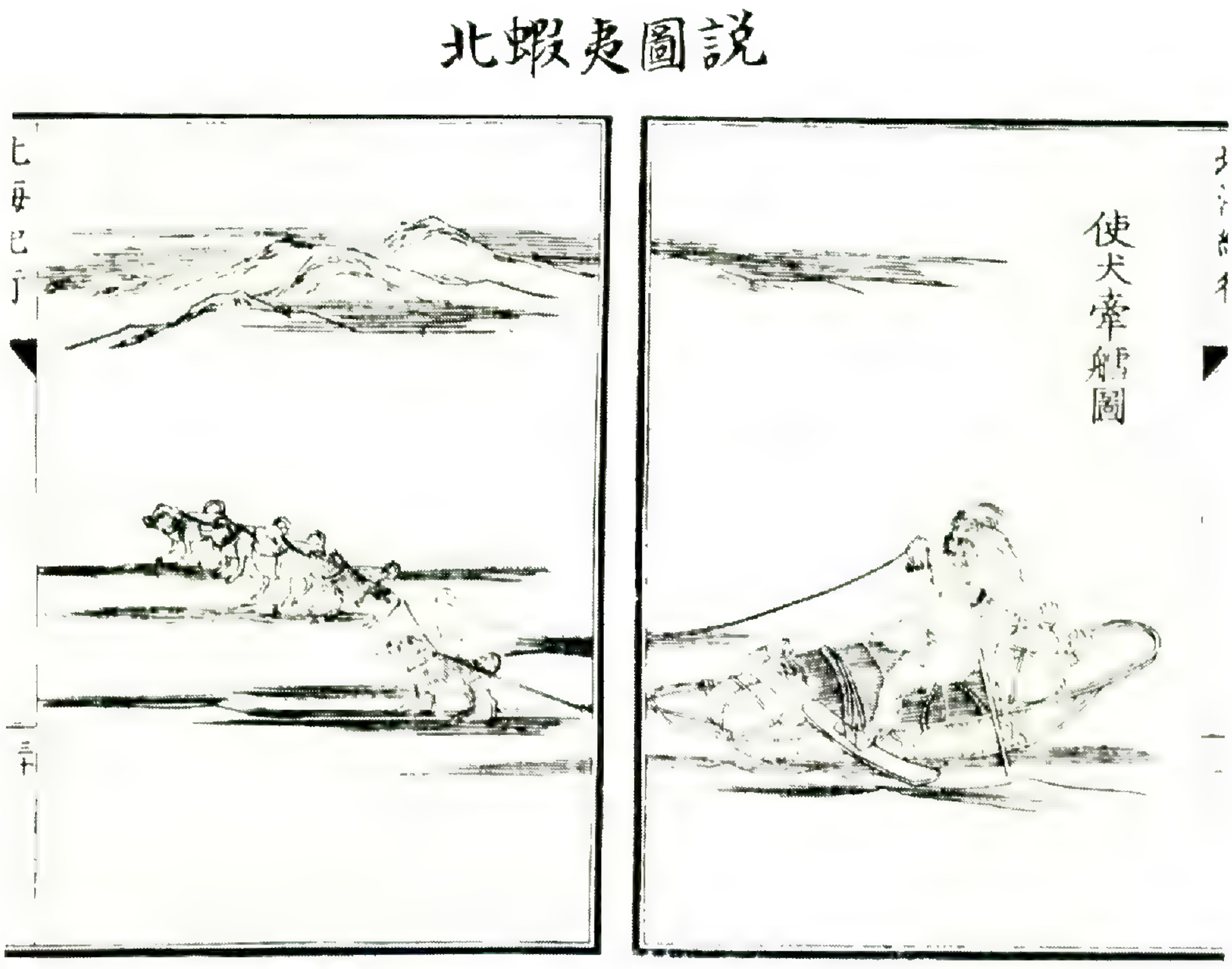


Fig. 61c. Dog-team and single-runner sled used by the barbarian natives of the interior of Sakhalin. The traveller appears to ride astride his pack, balancing the load and steering by shifting his weight from one snowshoe to the other. The snowshoes were supported at the front end by the side frames of the sled, from which they were prevented from slipping by being tied together by a rope passing over the pack; at the back they rested on the snow. The single sled runner carried the greater part of the weight, and the supplementary snowshoe at the sides sufficed to keep the sled balanced.

Exhibit 67. Matsuura Takeshirō, Ezo Manga (Pictures of Ezo). 1 vol. n. p. (published and copyrighted by the author), Ansei 6 (1859). A little book of color-prints depicting scenes in the life of the Ainu, derived from the writer's notebooks kept as official artist during exploring expeditions in Hokkaidō. Some of the pictures appear in other publications without color.

Fig. 62a, b. Ainu youth tracing maps in the sand and an old man supervising him. Batchelor tells us that the boys were taught

the names and shapes of mountains and hills by the men, and also the names and courses of the streams, so that they would not get lost while on hunting expeditions. Another illustration shows a group of Ainu stripping bark from elm and preparing fiber from it.

Exhibit 68. Matsuura Takeshirō, Kita Ezo Yoshi (A further account of North Ezo: Trip to Daruika and the Orokko). 1 vol. Ōsaka, Akitaya Taemon, Kawauchiya Shinjirō; and Edo, Suharaya Mohei, Yamashiroya Sahei, and 8 other book sellers, Ansei 3 (1856).

In the preface the author states that this book is an addition to that of Suzuki (Exhibit No. 72) and that pictures supplement the explanations and descriptions. It is an extract from the official report on the expedition to Karafuto (Sakhalin) in 30 volumes that was then presented to the Hokkaidō Government Office. In June 1854, the author parted from his companions to visit Daruika and the Orokko people, and rejoined them in July after having had the experiences recounted in this book.

北蝦夷餘誌

Fig. 63. Japanese dignitary, presumably the author, visiting Ainu at an island touched during the voyage to Sakhalin. The bearded Ainu are offering gifts of fish and other food. (From Matsuura's Kita Ezo Yoshi.)

Exhibit 69. Matsuura Takeshirō, Kusuri Nisshi (Kusuri diary). 1 vol. n. p., Bunkyū 1 (1861).

A record of a trip to Kusuri (now Kushiro) to explore parts of Ezo (Hokkaidō) that had been unknown, including lakes, hot springs, waterfalls, and showing that there was a vast fertile area. In twenty days time during March and April 1858 the author wrote eight books of notes on Akan, Mashu, Nishibetsu and Kusuri, which he turned over to the Hakodate Government Office. The published work is a summary of the official report, supplemented by illustrations. One picture shows a group of Ainu repelling, with bows and arrows, a party attempting to land from two foreign ships. This is an important book on the exploration of Japan's northern frontier in Ezo (present Hokkaidō) and Sakhalin. It contains notes on the vegetation and on characteristic plants which the explorer had not seen in the southern islands.

Fig. 64. Ainu men making fire, one twirling a stick between the palms of his hands to ignite some kind of tinder or punk in a cavity of a log, the other blowing through a tube to ignite a piece of bark from the smouldering tinder. The very first spark of fire obtained

was increased by sucking air through the tube rather than by blowing. The twirling stick was prepared for use by being soaked in water and then dried in the sun.

Exhibit 70. Hayashi Genzō, assisted by Kawasaki Sōhei, Hokkai Kikō (Hokkaidō travel account). 6 vols. (Vols. I-V, Appendix). Kanazawa: publisher, Jorandō, date of preface, Meiji 6 (1873).

The colored or tinted or white-and-gray illustrations are mostly colored maps of localities in which topography is represented by a mixture of panoramas. Whatever an observer would see looking directly from a particular spot is shown as he would see it, and the direction of the view is indicated by the alinement of the characters labelling the features shown. Thus, if there are characters at an angle or upside-down on the map, the map is to be turned until the characters are upright. Their vertical axis will point downward to the viewer's position. If the observer's route changed direction, vertically opposed panoramas would grade into horizontally opposed, so that the artist's device gives curious effects of vertical instead of gently rolling slopes where the line of travel deflects. The numerous detailed locality maps showing paths, water-ways and buildings would afford the present-day geographer an interesting basis for studies in the development of centers of population.

Other illustrations of no little ethnographic and ethnobotanical interest show Ainu scenes, marine algae and other products, and domesticated reindeer at Sapporo, introduced from Sakhalin. The botanical pictures pertain to the use of algae.

There is also an account of travel undertaken in 1873 by the principal author, Hayashi, and his companion and collaborator, Kawasaki, for investigating the geography, population and natural products of Hokkaidō. Their book reviews the history of the island from the time of the first Japanese expeditions (by Abe Hirafu, attributed to the period A. D. 661-665) down to their own time.

This work contains one illustration which might be taken to indicate that the Ainu of Hokkaidō travelled by dog-sled, and that they used short ski-like snowshoes. This picture actually was borrowed from Mamiya Rinzō's earlier book on North Ezo, which was not Hokkaidō but Sakhalin or Karafuto. The driver of a sled drawn by dogs is shown straddling the pack, apparently using his short skis or snowshoes, front end resting on the sled frame and back end on the snow, to aid in steering. In the older book on Sakhalin this picture is a companion to another which also shows the same narrow and short upturned-board skis.

北海紀行

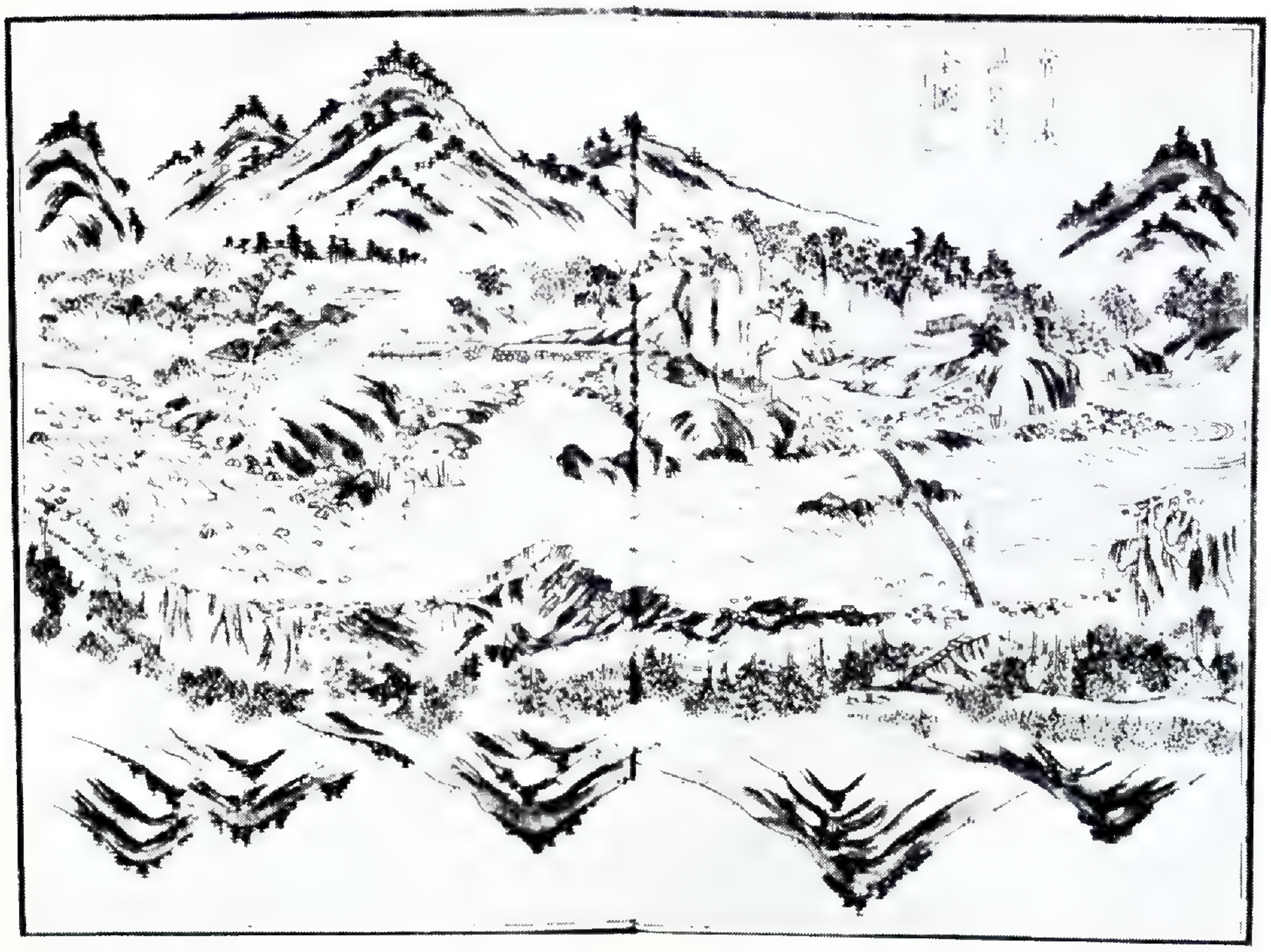


Fig. 65. Illustration from the Hokkai Kikō shows the location of the Jōsan hot spring in Hokkaidō, picturing the topography as one travelled along the stream, by opposed panoramas, of which the upper one, right-side-up, represented what the traveller going down-stream would see looking directly to his left, and the lower one, upside down, what he would see to the right. The borrowed picture of dog-sled travel in Sakhalin, not Hokkaidō, will be found as it originally appeared, in the description of Mamiya Rinzō's Kita Ezo Zusetsu.

Exhibit 71. [Kuniteru (Ichiyōsai) Eitaku (Senchō) and Hiroshige II, artists], Ezo Kaitaku Nishikie (Pictorial record of Buddhist mission to Hokkaidō). n. p., Meiji 4 (1871).

This set of 16 color prints was produced by the artists officially appointed to accompany a Buddhist mission including a high priest which went to Hokkaidō in 1870. The sheets are as follows:

(1) Large triptych showing many boats filled with residents meeting the ship on its arrival at Sapporo, and a delegation ascending the gang-way. (2) Reception aboard a highly decorated boat. (3) Visitors inspecting the making of a new road by a group of Ainu. Foxes (?) look on from

the reedy place at the edge of the water. (4) A large party greeting the high priest where a post at the wayside reads "Area belonging to Higashi Honganji (Meiji 3)." Two deer join in greeting the delegation and a third stands in the marsh nearby. (5) Ainu homestead. High priest and attendants visiting the sacrificial bear, which is confined in its cage. Skulls of formerly sacrificed bears on stakes and sacred inau sticks near the house. (6) Interior of Ainu house showing all the goods and chattels, and reception of the high priest by the occupants. (7) Reception given by the administrator of Sapporo to the Buddhist delegation and the assembled Ainu. (8) Scene on the rough coast between Otaru and Amarushi. (9) Building a road and placing an inscribed boundary pillar in Oshima Province. (10) Beach at Otoshibe Village, Oshima Province. The visiting delegation receives offerings of fish, etc. (11) Drying kelp on the beach at Utasutsu Village. On the day of the visit of the high priest, the Ainu discovered and harvested much kombu (the sea-weed Laminaria) which brought such great profit to the villagers that they helped make the road. (12) A dangerous pass on the journey. (13) At Otaru, near the tunnelled headland they saw a giant sting-ray, the strange zenibako, fish that looks like a crab. (14) When the high priest visited, the Ainu went fishing at the wrong season, and, surprisingly, got a lot of fish. (15) Leaving Amaru in the early morning, by the beach path. (16) Boundary post of Sapporo Government. The Buddha bird (Aodakodanchō, a wild pigeon) on Tilia branch.

Exhibit 72. Suzuki Chakei, Karafuto Nikki; Jō, Ge (Diary of a trip in Karafuto, with explanatory notes by Matsuura Takeshirō). 2 vols. Edo: copyright of Vol. I by Bun'enkaku; of Vol. II Harimaya Katsugorō, Ansei 7 (1860). Illustrations of Vol. I (Jo) by Hashimoto Gyokuran, some signed "Takeshirō copied"; those of Vol. 2 (Ge) by editor Matsuura Takeshirō himself.

The preface by the author, Suzuki Chakei, states: This diary is not intended to be read by the public, but I want to write out an account of my trip, in which I had to suffer a great deal, to show my children and grandchildren how precious even a drop of water is. I hope that this account of my trip will become a family teaching.

A short preface by Takeshirō states that in Kaei 7 (1854) Mr. Suzuki went to Karafuto. From Shushuya he went into mountains that no one else had yet visited, from Naibutsu on the eastern coast to Shiranushi which is in the interior. This book is an extract from his diary.

Suzuki, in Kaei 7 (1854), in company with a man named Yohori,

left Soya (located on the western coast of Hokkaidō) from which place a boat sailed to Karafuto. He reached Shiranushi, Karafuto, the next day. Because of the wind they landed on Kushunkotan. His companion joined another party, while Suzuki, with a Mr. Mizuno, went to investigate Shiretoko peninsula, a very rugged place. This trip lasted from June 12, 1854 to July 8 of the same year.

Fig. 66. This picture, from Suzuki Chakei's Karafuto Nikki, by artist Hashimoto Gyokuran, shows a muddy place at Koi near the Arai River, covered with a gigantic herb called rorokuni by the natives and kintō or fuki by the Japanese "growing densely like bamboos, so that the leaves crowd each other. No matter how much rain and dew there is on the mountain path, one leaf

will suffice as an umbrella." Kintō is said by Batchelor (4) to be Petasites japonicus. The fleshy petioles are edible, and are called in English bog-rhubarb.

XI. BOOKS ON PLANT AND ANIMAL RAW PRODUCTS, TECHNOLOGY, MANUFACTURES AND TRADE
(Exhibits 73 to 75)

Exhibit 73. Hirase Tessai, Nihon Sankai Meibutsu Zue (Pictures of famous Japanese products of land and sea). 5 vols. Illustrated by Hasegawa Mitsunobu [Kōshin]. Edo and Osaka, Kansei 9 (1797).

(This ed. mentions the one listed by Serrurier, Cat. no. 875, as of Hōreki 4 (1754). Brown records the 1st ed. as of 1730, and another ed. of 1799. British Museum has eds. of (?) 1800 and (?) 1810.)

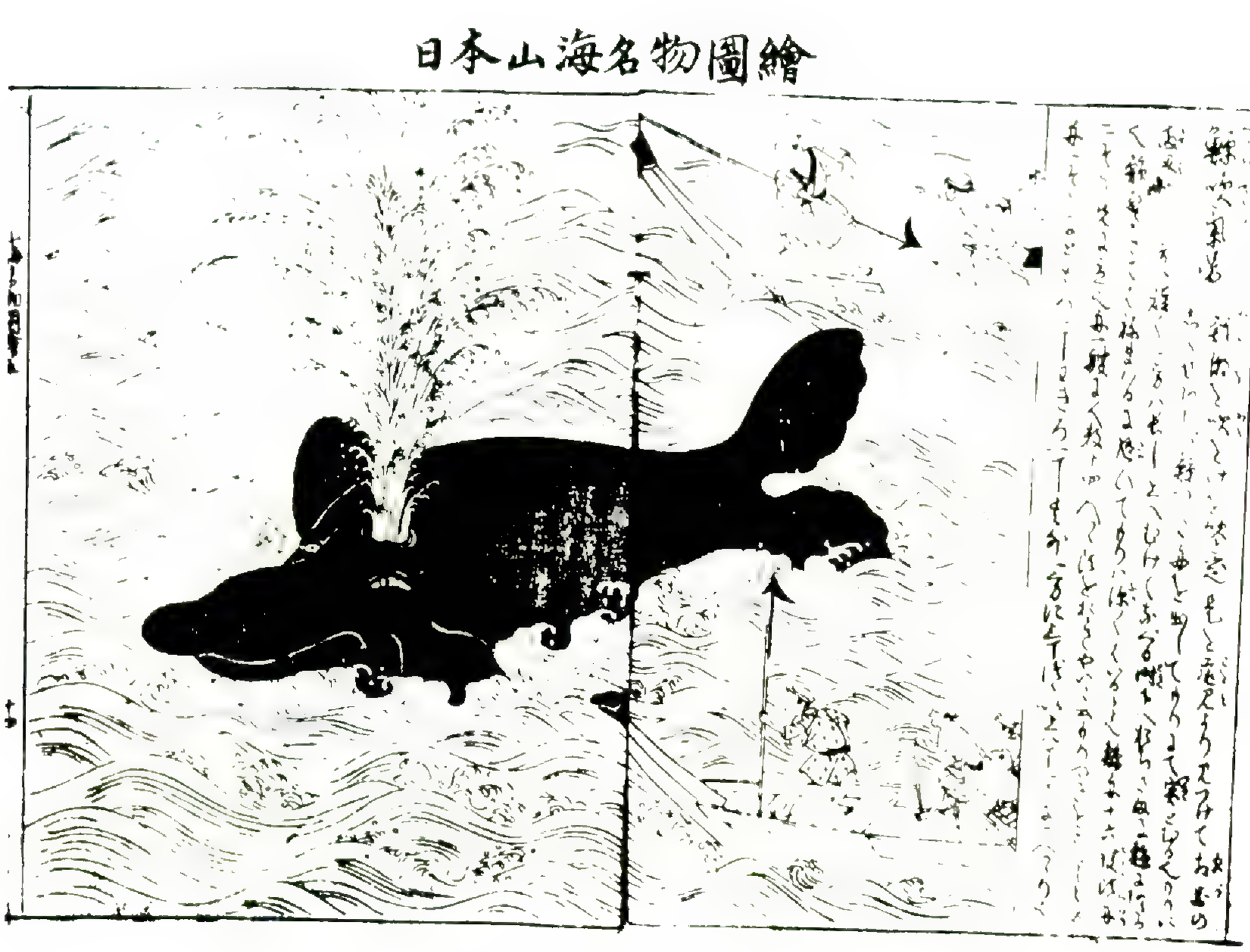


Fig. 67a

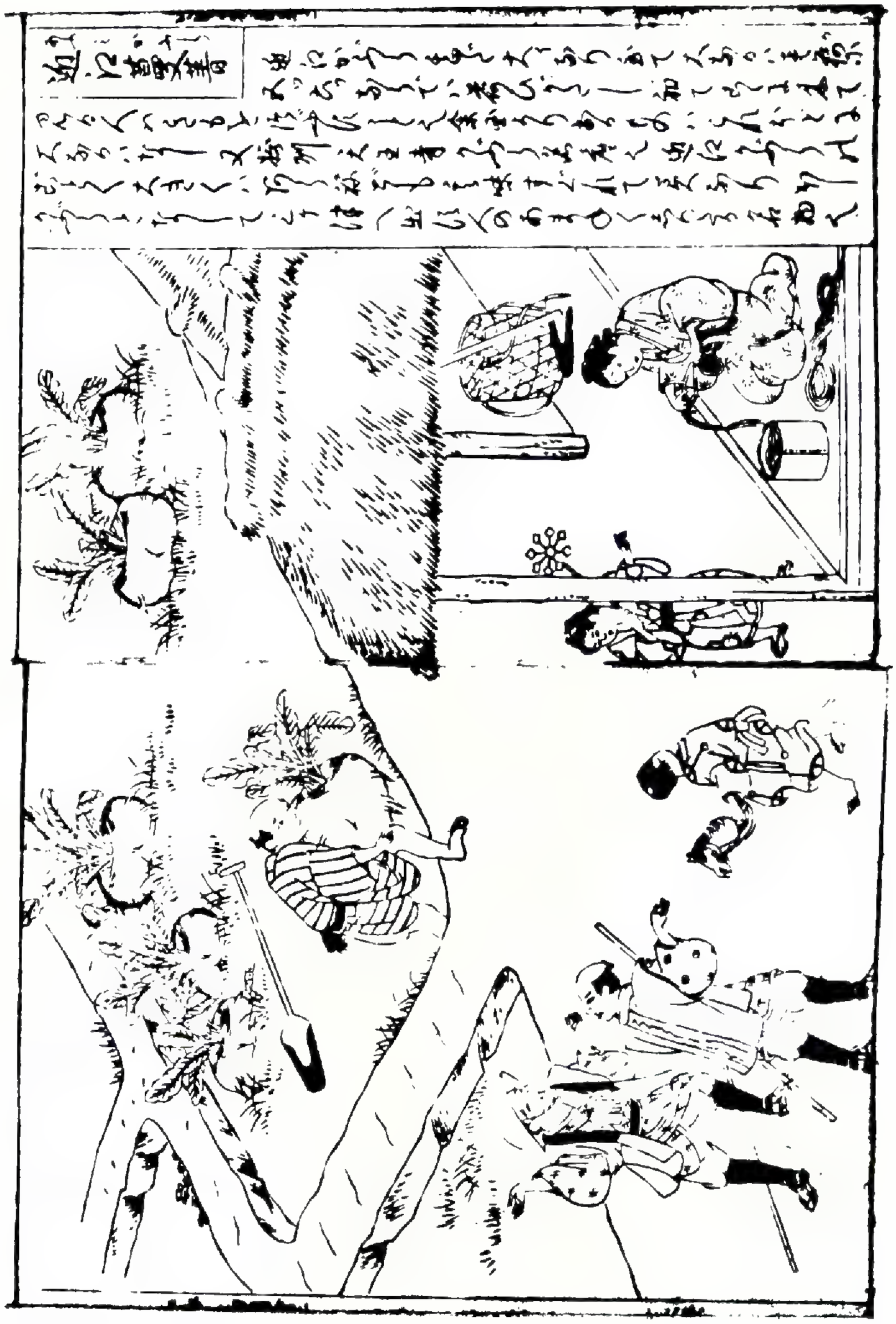


Fig. 67b

Fig. 67a, b. We reproduce (from Vol. II, leaves 15-16; Vol. V, leaves 13-14) woodcuts of the "picture of a whale spouting," one of four remarkable pictures on the killing of a whale, and of the giant turnips of Ōmi Province. Our author says: Spouting of a whale gives a signal to people far away. They go out and attack the whale with double-bladed harpoons. One blade is short, the other long. The more the whale struggles, the deeper goes the harpoon into its body. For the initial harpooning, 16 boats go out, two leading the rest, but more boats are needed to complete the catching of the whale.

This work is of extraordinary ethnobotanical interest. It

deals with the gathering and treatment of mochi no ki (Ilex integra) bark for making bird-lime (torimochi), the plucking and drying of tea, the preparation of dried persimmon fruit, the growing of the gigantic turnips and radishes, paper-making, rope-making, the harvesting and utilization of seaweed, the tapping of the lacquer tree (Rhus vernicifera) and the marketing of edible mushrooms. In the pictures illustrating the growing and harvesting of turnip roots (which are said to become four or five feet long in Iyo Province) the artist allowed himself a little joke by showing two persons struggling along with a single root on their shoulders.

Exhibit 74. Kimura Kōkyo, Nippon Sankai Meisan Zue (Japanese famous products of land and sea pictured), illustrated by Kangetsu Hokkyō (pseud.) [Kangetsu Shitomi], who was a pupil of Masanobu Tsukioka. 5 vols. Ōsaka, 1799.

This work is listed for the British Museum (Anderson, Cat. p. 364); Univ. Leiden (Serrurier, Cat., no. 879); Stockholm (de Rosny, Cat., no. 21, dated 1798).

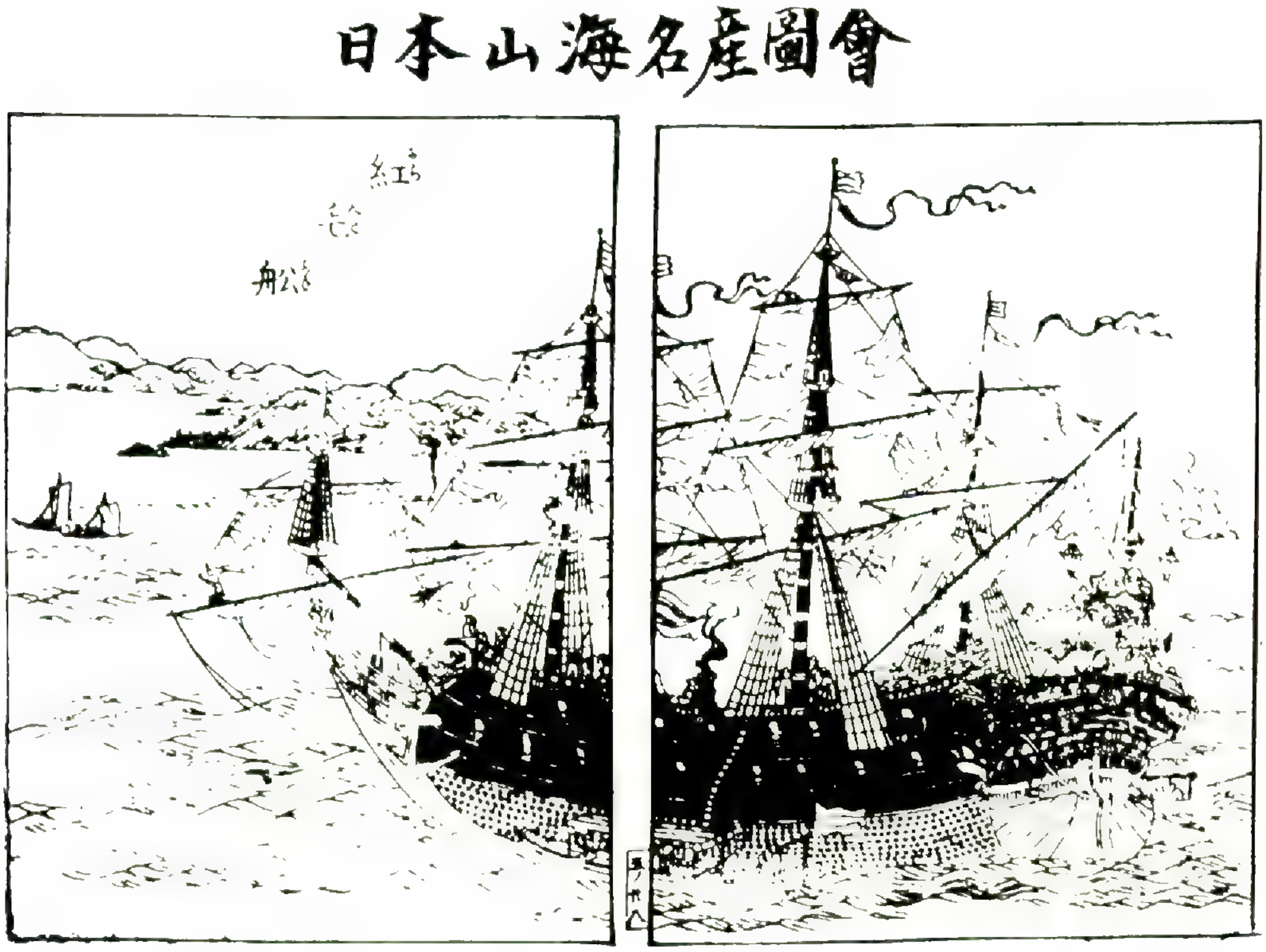


Fig. 68a. Foreign ship at the port of Nagasaki, where the Dutch held a monopoly of European trade for nearly two and a half centuries. It is not generally known, however, that during the period when the English held Java, the ships that traded at Nagasaki were American, and that there had always been more or less continuous traffic between Japan and China.

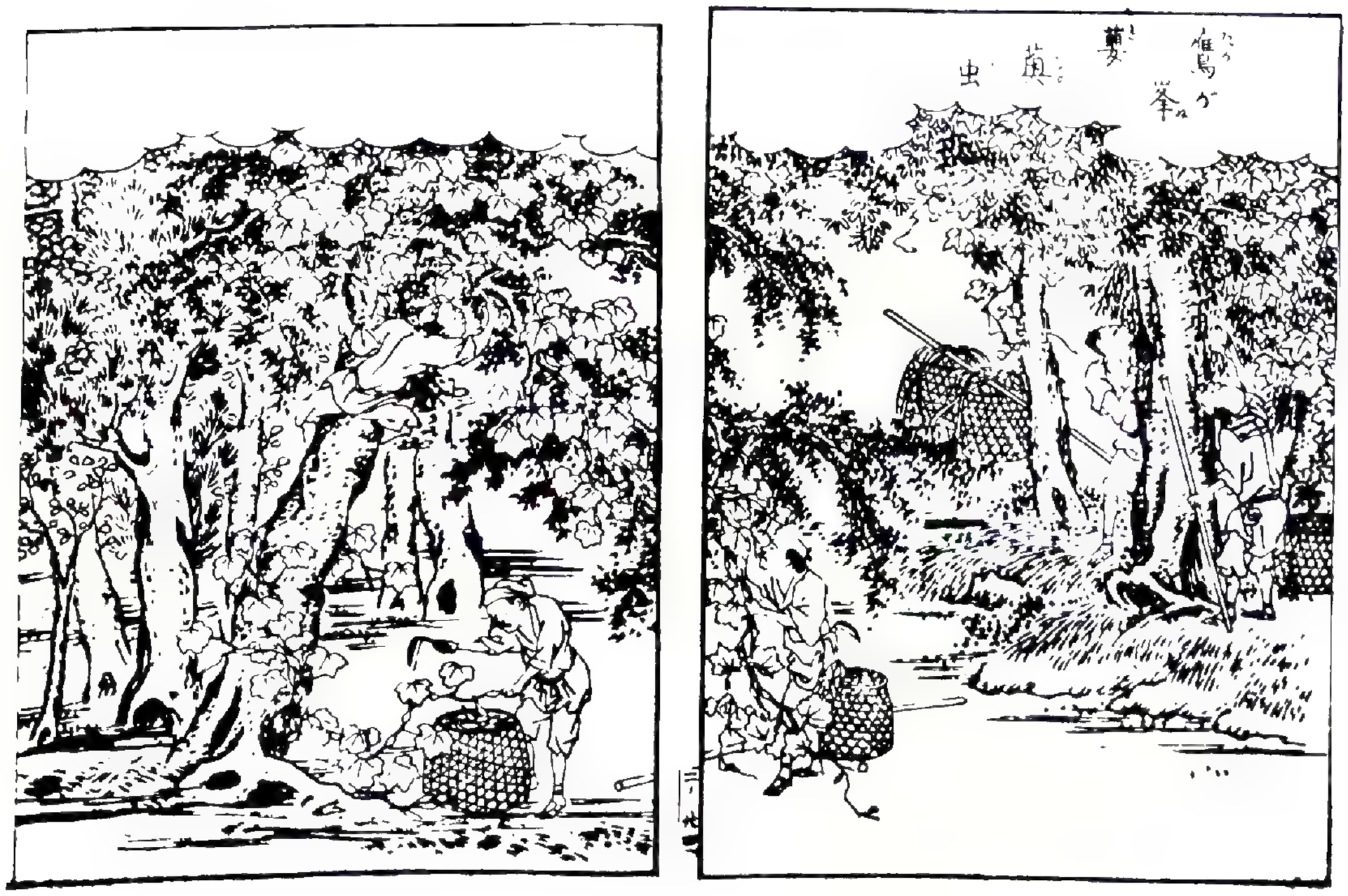


Fig. 68b. Gathering the curious product taka-ga-mine ebizuru no mushi (larvae of the wild grape vine). According to Kimura Kōkyo, the wild grape vines have swellings here and there which contain white larvae. These are good to cure children's convulsions, so they sell them in the market, without taking them out of the stem swellings. In the southern cities where there are no regular grapes they take out the seeds of the wild grapes and boil them, and use the substance obtained like oil. On the surface of the leaves are hairs. They are dried and sifted between the fingers for use to cure warts--hence the name "wart-remover."

Exhibit 75. Kondō Kōsaku and Kunitō Jihei, Ikkotei Chawa, Kamisuki Chōhōki (Tea talks at Ikko arbor and useful records of paper making). 1 vol. Ōsaka: editor and publisher, Nishijima Toshu, Shōwa 18 (1943).

A modern reprint of two entirely distinct works. The Ikkotei Chawa was first published by Kondō Kōsaku in Meiji 5 (1872) and dealt with tea (omitted from this edition) as well as with paper and paper plants. The second work, Kamisuki Chōhōki, with pictures by Yasunaka (Niwa) Tōkei first appeared in Kansei 10 (1798).

The manufacture of paper from the barks of various trees as well as from fibers obtained from straw and other herbaceous sources has been an important industry in the Orient for hundreds of years and was doubtless long preceded by the use of barks for making the kamiko (paper-robe), Japanese equivalent of the Polynesian garment of tapa, or bark cloth. It is therefore of the greatest interest from an ethnobotanical standpoint. The first of the reprinted writings in this little book deals with the slow official response to Kondō Kōsaku to his appeal to be allowed to extend planting of paper plants in the region of Ōsaka, and the establishment of a factory to make the raw products into paper. Eventually, however, it resulted in the establishment in Ōsaka of a company. The present publication was carried out by the Paper Industry Publishing Company of Osaka. The second of the two reprinted works, that of Kunitō Jihei, had already had a modern edition (of 1925) published by Horikoshi Jusuke of Ōsaka to commemorate the 1200th anniversary of Kakinomoto Hitomaro, the legendary tutelary protector of paper makers. Horikoshi wished to promote the publication of good books. This new reprint followed when the former went out of print.

Under good conditions the kamikusa sprouts may grow to be nine feet high. They multiply by five every year. Sometimes the grower made sales by contract with buyers for the paper makers before the crop was cut, just by estimate. (From the reprint of Kunitō Jihei's Useful records of paper making, which reproduces 28 ethnobotanically most interesting woodcuts which begin with pictures of the tutelary ancestor and the kamikusa plant, continue with illustrations of all processes of paper manufacture, and end with a view of the shrine to the ancestral guardian Hitomaru in Sesshū Province.)

一壺亭茶話
紙漉重寶記

Fig. 69. Harvesting the kōso or kamikusa sprouts for paper-making in October.

XII. BOTANICAL COMMENTARIES ON ANCIENT LITERATURE
(Exhibits 76 to 77)

Exhibit 76. Fuchi Zaikan, Mōshi Riku-shi Sōmoku Zukai (Illustrated commentary on Riku's treatise on plants of the Book of Odes). 4 vols. (i. e., 3 vols. + supplementary vol.). Edo, An'ei 7 (1778). Vol. I, plants, 2 + 15 lvs.; Vol. II, plants, 1 + 14 lvs.; Vol. III, birds, 13 lvs.; Supplement, musical instruments, utensils, ceremonial objects, chariots, weapons, costumes, ornaments, furniture, 22 lvs. The copy at Leiden (Serrurier, Cat. No. 754) is in 5 vols., Miyako, 1779.

Fig. 70a. Since at Ann Arbor the "Phoenix Project" has created special interest in the legends of the Phoenix, and since these interesting old volumes have some of what has been called "unnatural natural history," we reproduce the figure of the mythical phoenix (Vol. III, leaf 2). According to our author, the phoenix was recorded of old to eat only bamboo fruits, to live only in the aogiri (Paulownia) tree, to have the neck of a chicken, the head of a serpent, the bill of a swallow, the back of a turtle, and the tail of a fish. There were five kinds, each of which was of the same five colors, but in each one of the five kinds a different color was predominant.

In order, however, to give a fairer idea of the prevailing verity of these old (presumably originally Chinese) figures, and of the

reliability of the old-time naturalists, we also include a page of the botany. The author Riku, on whose work this one is a commentary, is said to have written in the Tang dynasty. The Book of Odes is supposed to date from about 900 B.C.

Fig. 70b. A page of Fuchi Zaikan's Commentary on the Book of Odes. The figures show kama, the cat-tail (Typha) and hachisu, the sacred lotus (Nelumbo nucifera). A modern but incorrect dictionary definition of kama is bull-rush. The word is now pronounced gama and, according to Makino (46), is the name for Typha latifolia. The smaller Typha orientalis is kogama (lesser cat-tail) and the still more slender Typha angustifolia is himegama (princess cat-tail).

Exhibit 77. Oka Kōyoku, Mōshi Himbutsu Zukō (Illustrated treatise on things in the Book of Odes). Artist, Yūhōsai Kunio of Naniwa (Ōsaka); engravers, Ōmori Kibei and Yamamoto Chōzaemon of Heian (Kyōto). 7 vols. in 3. Book sellers, Onogi Ichibei of Naniwa, Suhara Mobei of Edo, Chimata Bunsa of Naniwa, and Kitamura Shirōbei of Heian, Temmei 5 (1785).

Vol. I, herbs, t. p. (pasted to cover) + 1 + 1 + 3 + 2 + 1 + 25 lvs.; Vol. II, herbs, 10 lvs.; Vol. III, trees, 23 lvs.; Vol. IV, birds, 20 lvs.; Vol. V, warm-blooded quadrupeds, 12 lvs.; Vol. VI, insects, arachnida and reptiles, 11 lvs.; Vol. VII, fish and reptiles, + 8 + 1 lvs. + colophon (pasted to cover). (A copy at Leiden; Serrurier's Cat. No. 755.)

A second copy, unchanged, having only Vols. I to IV in two binder's vols., has a publisher's advertisement of a book on ethics pasted to the inside back cover.

Illustration (Fig. 71) from the Mōshi Himbutsu Zukō appears on the opposite page.

Fig. 71. The mukuge, in English called rose of Sharon (Hibiscus syriacus), emblem of Korea, cultivated there and also in China and Japan for many centuries. The Japanese name comes from the Japanese pronunciation of the characters in which the Chinese name is written.

XIII. BOOKS OF ART OR SINGLE PRINTS

ILLUSTRATING PLANTS; ARTISTS' SKETCH BOOKS
(Exhibits 78 to 89)

Exhibit 78. Hōbashi (Ōoka) Shunsen, artist; Fujimura Zen'emon, engraver; Ehon Fukujusō, Jō; Chū; Ge (Adonis picture book, I, II, III). Naniwa (Ōsaka): book store, Seibundō, Hōreki 5 (1755).

Fig. 72. Adonis amurensis from Hōbashi's Adonis picture book, which, appropriately to its name, begins with this picture of the fukujusō, a favorite flower of the Japanese whose varieties gave rise to one of the highly specialized floricultural hobbies of Japan.

Fukujusō is one of the most beautiful in the collection. The author who was also the artist made several hundred sketches of plants many of which he published here, with indication of their seasons and names, both Chinese and Japanese. For each flower he composed or quoted an appropriate poem.

Exhibit 79. Yamaguchi Soken, Soken Gafu: Sōka no Bu, Jō; Chū; Ge (Soken's pictures of herbs and flowers, Vols. 1, 2 and 3). Kyōto, Bunka 3 (1806).

The artist who signed his paintings "Soken" contributed to several anthologies in which a group of artists collaborated. The present work by himself alone, in black and gray, reproduces sumi-e, or original paintings done with dilutions of India ink. It is remarkably naturalistic and beautiful in execution. Many of the woodcuts appear to have been printed from two blocks only, one for black, printing stems and veins of the leaves, and the other for gray. Other prints which have a two-toned effect may possibly have been produced from a single block, for the grays are rendered by printing from a roughened surface, either variously abraded to give different depths of black or skillfully wiped after inking, so as to print with varying intensity. It seems more likely, however, that a second block of quite different and rougher texture was used to print the grays. The veins of the leaves are often intensified by being irregularly bounded by white. The flowers are generally outlined, but the foliage not. Stems were printed sometimes in black and sometimes in gray. The work has no text, not even names of the plants are given on the prints, but the table of contents includes the names.

The artist Yamaguchi Soken, commonly called Takejirō, produced this series of three volumes as the first of a trilogy. A second series of three volumes was announced as to be made up of pictures of gardens and landscapes, a third series, also of three volumes, was to represent mankind. He was born at Kyōto; studied with Maruyama Ōkyō; died in Bunsei 1 (1818) at 60. His unconventionally produced illustrations of plants were remarkably realistic, but he is said to have also excelled in portraying women.

The first volume of his plant pictures is begun with a picture of flying storks (tsuru) and concluded with one of a turtle (kame) but these were presented not as illustrations but as conventional symbols of long life and good fortune.

Fig. 73b

Fig. 73a

Fig. 73a. The opium poppy (shiro keshi, Papaver somniferum) from Soken Gafu.

Fig. 73b. Japanese thistle (azami, Cirsium japonicum) from Soken Gafu.

Exhibit 80. Satō Masuyuki (Suiseki), Suiseki Gafu, Nihen (Supplementary album of pictures). 1 vol. Kyōto, Tennōjiya Ichirōbei; Edo, Suharaya Mohei; and Osaka, Kawachiya Kibei, Bunsei 3 (1820).

This volume is complete in itself, picturing plants, birds, fish and insects. The work to which it was considered supplementary (or of which it was "Vol. 2") was the Suiseki Gafu, 1 vol., Ōsaka, 1804, which Brown says consists of scenes from everyday life. A Vol. III was announced but may never have been published. It was to have been Famous places of Naniwa [Ōsaka].

Suiseki Satō (active 1807-1820) was a painter who illustrated several collections of poems and also published two or three books of sketches. In the rare volume exhibited (drawings of birds and flowers) some of the sketches are extremely beautiful but others seem to be experiments in crudity. Brown(12), p. 93) says of Suiseki and his contemporary Baitei, that they "flung rules utterly aside and expressed what they wanted to convey in the boldest and most abrupt fashion ... If one admires the beauty and flowing lines of a print by Utamaro, he may also have moods when the tremendous daring and strength of the rebellious souls of the bujinga school ... seem, for the time being, at least, the very essense of art ..."

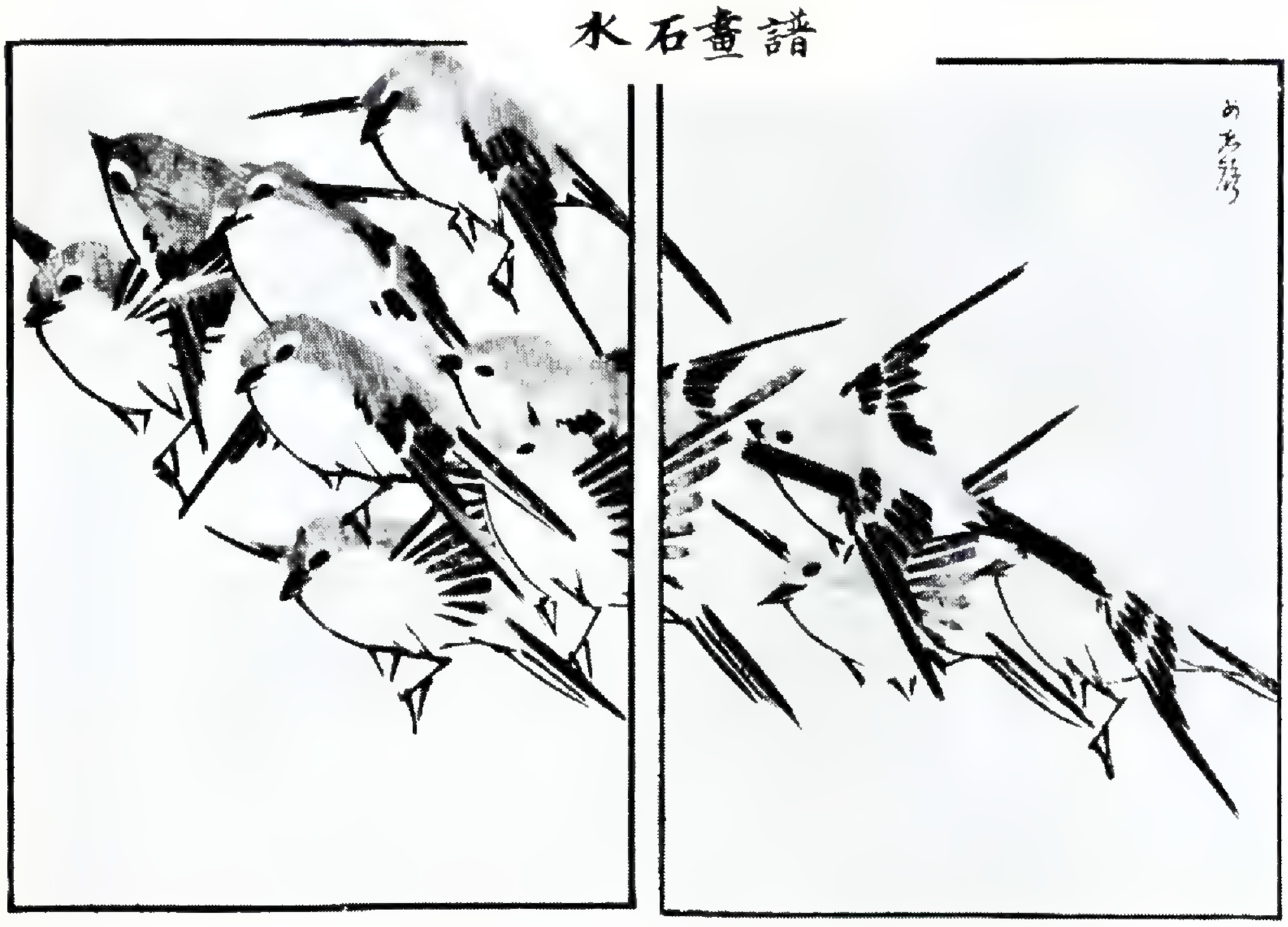


Fig. 74. Flock of birds from the Suiseki Gafu, Nihen, one of the several very effective impressionistic pictures in this volume, which has been extravagantly admired by artists.

Exhibit 81. Anon. [Photographs of fifty paintings in an unidentified exhibition]. n. t., n. p., n. d.

The glossy gold-toned photographs may date from about 1900 or earlier, and that they do not represent the entire exhibition is indicated by the numbering, which goes to 65. Some of the paintings are by artists whose work appears in the wood-block books of flowers, birds, etc. Among them are: Imao Keinen (stream with carp); Watanabe Shōtei (sacred lotus); Kōno Bairei (flowering cherry and birds); Taki Katei (streamside vegetation, ca. 1884).

Exhibit 82. Anon., Honzō Shasei Fu (Sketch-book of plants). MS, 32 water-color paintings. n. p., n. d. The date must be about 1893, for a teratological form of a fully double, sterile flowering-cherry with axis prolonged as a green, leafy branch is pictured as having blossomed in the spring of Meiji 26 (1893). Collections of old Japanese books often contain such manuscripts, which are sometimes based on published works, but sometimes represent work which never came to publication or was never intended for anything but a private notebook. Sometimes drawings or paintings turn out to be the originals of published illustrations which were not destroyed by the wood-block cutter because they were too big to be pasted on the block or were on the wrong kind of paper and had to be copied for the engraver.

Fig. 75. Hibiscus Manihot is reproduced from this manuscript. A favorite flower, it is frequently included in the kachō and related works. It was also important industrially in paper-making and therefore in printing. In the manufacture of fine paper from the bark of the paper mulberry, Broussonetia papyrifera, the mash of suspended fibres was mixed with mucilage from the root of oreni, Hibiscus Manihot. Paper made from this mixture was stiff and strong, could be twisted into twine or rope, and ink applied to it did not penetrate and spread by capillarity.

Exhibit 83. Kōno Bairei, Chigusa no Hana; Ichi, Ni, San, Shi (Flowers of a thousand kinds; Vols. I, II, III, IV). 4 vols. Kyōto: copyright, Unsōdō; publisher and printer, Tanaka Jihei, Meiji 22-24 (1889-1891).

Vols. I and II have lists of the illustrated plants with the Japanese names in syllabic characters (katakana) and Roman (Rōmaji). Vols. III and IV have katakana only. All volumes likewise give the names in Chinese characters, if known. There are 50 pictures in each volume, and each is accompanied by a brief description of the plant and statement of the habitat.

Fig. 76a. Adonis amurensis, the favorite fukujusō, the first plant figured in Kōno Bairei's Chigusa no Hana. Adonis was much

fancied by the floriculturists, for potted plants from outside would promptly flower in midwinter if brought into the house.

Fig. 76b. Kōno Bairei's figures of Momordica from the Chigusa no Hana, called by him nagareishi (left) and tsurureishi (right).

Exhibit 84. Kōno Bairei, Bairei Kiku Hyaku Shu (A hundred varieties of chrysanthemum). 3 vols. Kyōto, Meiji 24, 25, 29 (1891-1896).

This work is printed in dilutions of black and dull orange, so the entire series is a reversion to an old mode of achieving contrast by the use of one color only in addition to black. If pink predominated, the print was beni-e; if orange or vermilion it was tane-e; if only black and its dilutions to various shades of gray were used, it was sumi-e.

The chrysanthemums show all of the usual morphological variations. Some of the pictures have a landscape background which may or may not seem obtrusive and inartistic. Others have a bird or insect as an accessory, generally pleasingly introduced, or some garden or household implement.

Fig. 77. One of Kōno Bairei's "hundred varieties of chrysanthemum," the very large-flowered one called kurumagaeshi ("turning wheel spokes") with the praying mantis, called kamakiri by our artist, but that ordinarily means "grasshopper."

Exhibit 85. Hiroshige Andō, Ukiyo Gafu; Sampen (Pictures of the fleeting world; third). Nagoya: publisher, Eirakuya Tōshirō, n. d.

This may be the third volume of the work listed by Toda (90) as Ukiyo Ryūsai Gafu, of which the third volume only, by Hiroshige, is in the Ryerson collection. Possibly two earlier volumes were by Eisen, for the two artists collaborated in a three-volume work which has been listed as Ryūsai Gafu and Ukiyo Gafu, Nagoya, ca. 1836.

The preface by Rōshōnen (pseudonym: "Eternal Youth") says: Those who paint snow cannot paint its purity; those who paint the moon cannot paint its brightness; those who paint flowers cannot paint their fragrance; those who paint dew cannot paint its freshness; those who paint mankind cannot paint their feelings and sentiments. Only through Hiroshige's paint brush can we see all these; without stepping out we see the scenes of ukiyo, the fleeting world.

Fig. 78. Narihira, a hero of the Fujiwara clan looking at iris plantings, attended by his sword bearer (above). The famous Murasaki Shikibu, authoress of the Tales of Genji, of whom it was related that working by night, she was inspired by seeing the full moon shining over Lake Biwa (below). (From Hiroshige's Ukiyo Gafu.)

Exhibit 86. Maruyama Ōkyo-ō (= Enzan Ōkyo-ō), En'ō Gafu, Kan; Kon (Pictures by En'ō, Vols. I, II). Kyōto: publishers, Bunchōdō, Yoshida Shimbei, Tempo 8 (1837). Ōkyo-ō (also En'ō, 1733-1795) was the pen-name of Maruyama, founder of a school, who has been considered a master of realism. He was the first artist in Japan to apply Western rules of perspective. His own studies were particularly of people, birds, and flowers. His work was in part highly impressionistic. He often indicated the form of a mass of foliage, for example, only on an outline block and then covered the whole area of its occurrence on the picture with a flat, uniform, transparent green.

Fig. 79. Ladies gathering lotus. (From Maruyama Ōkyo-ō, En'ō Gafu.

Exhibit 87. Kobayashi Eitaku, editor and artist; Ōtsuka Tetsugorō, engraver, Bambutsu Hinagata Gafu (Little sketches of many things). n. p., Meiji 14 (1881).

The "little sketches" are highly miscellaneous and, being too late in date, the book is only included as a late survival of a type of publication much in the spirit of the old picture encyclopedias for children and the later books of instruction for beginners in drawing. Most of Kobayashi's sketches appear to be his own, and so may be either pre-Meiji or Meiji, for he lived from 1843 to 1890; but the page reproduced is a copy from Hishikawa Moronobu (1645-1715), the father of popular book illustration in Japan.

Fig. 80. Drawings by Moronobu, after Kobayashi Eitaku. Left: kabuki dance of Izumo Province. Right: grapes (budō, Vitis vinifera), a record of successful growing of the European grape in Japan in the 17th century. It may have been taken to the Far East by the Portuguese.

Exhibit 88. Ogata Kōrin, Kōrin Manga (Kōrin's miscellaneous sketches). 1 vol. Edo: publisher, Takegawa Tōkei, Bunka 14 (1817).

This is one of the works of Kōrin (1661-1716) that was first published more than a century after his death. Kōrin was best known as a designer rather than as a naturalistic illustrator. His best known works were paintings and magnificent lacquer screens, and during his lifetime none of his art seems to have taken the form of book illustration. He was wealthy by inheritance and ended his life as a priest, under the name Nichijin. Sakai Hōitsu (1761-1828), high priest of the Nishi Hongwan-ji (Temple) in Kyōto, so greatly admired Kōyetsu and Kōrin that he left the priesthood in order to found a school for perpetuating the fame of these masters. While compiling the works of Kōrin, Hōitsu sought Kōrin's grave and found it in the temple cemetary of Myōken-ji at Kyōto. On the hundredth anniversary of Kōrin's death, the memorial edition of his work was published by Hōitsu. Before this, however, other followers had published collections of Kōrin's greatly admired simple drawings of flowers and plant forms (1735 and 1802). This similar collection of 1817 was followed by another in 1818, and his seemingly inexhaustible output was drawn upon for new publications down into the present century. Kōrin's drawings show his feeling for what botanists call general plant "habit" and harmony of line.

One of his early pictures (Fig. 81) appears on the following page.

Fig. 81. We reproduce one of the first pictures of the Kōrin Manga, showing Clematis.

Exhibit 89. Katsushika Hokusai, Hokusai Manga (Hokusai's miscellaneous sketches). 15 vols. Kyōto: publisher and printer, Yamada Naosaburō; distributor, Unsōdō, Meiji 45 (1912).

Too rare for a set to be made up from the original editions, this modern reprint of Hokusai's famous Manga is a very acceptable substitute. Although Hokusai is best known for his landscape paintings, one of his works (Fig. 82) is here reproduced because of its special botanical interest.

Fig. 82. Useful plants as depicted by Hokusai.

XIV. BOOKS OF ART OR SINGLE PRINTS FOLLOWING THE KACHŌ TRADITION OF "FLOWER AND BIRD" PAINTING (Exhibits 90 to 101)

Exhibit 90. Anon., Drawings and paintings for a kachō, or work on flowers and birds. MS. n. p., n. d.

This manuscript, as purchased, was in bad condition, for an accumulation of individual paintings had been pasted into a blank book of accordion format which was too small, and without regard to where the folds came. The margins of some pictures had been trimmed off and the pictures themselves were considerably overlapped. They have therefore been removed and mounted separately --a laborious job. The book-seller's description (Orientalia, New York) read: "193. Kano School Manuscript. Album of about 150 pp., mostly drawings, one side containing birds, the reverse flowers, nearly all painted in colors, and from life ... A remarkable example of primitive coloring in flat tones. MSS. of this length are practically unknown in this country. The Bird and Flower Life in Japan forms so important a part of their art that supreme importance must be attached to an early manuscript of this length and character."

It was discovered, however, when the pictures were removed from their accordion-folded mounting that the flat coloring of the plants (merely crude rather than primitive) was later than the drawings, having been applied after the trimming and mounting of the pictures, for it extended only to the line of overlapping. The coloring of the flowers was left incomplete, for the colorist gave chief attention to applying a flat, opaque green to the foliage, and some drawings that had been entirely covered over were uncolored.

The skillful coloring of the birds, however, was probably done by the artist when the drawings were made. Most were done in rather transparent water color. The only evidence of date is that the phoenix, drawn in the traditional manner, is not colored, and the realistic artist had covered it up and somewhat mutilated it, indicating that he was not credulous enough to wish to include an imaginary bird. This might indicate a date considerably later than 1650, for the authors of seventeenth century books included the phoenix quite as a matter of course.

花鳥畫集

Fig. 83. Clematis florida, from MS drawings and paintings for a kachō, or work on flowers and birds. The name on the painting is tessen, still applied to this Clematis in Japan. It means "iron-wire vine."

Exhibit 91. Yamashita Morinori, Hyakkachō (Picturing birds and flowers). 5 parts in one vol. Edo, 1728. Another ed., 4 parts in 2 vols., Edo, published by Izumi, 1729. A book of model sketches in black for coloring in the style of the Kano school of painting, containing instructions about coloring.

Fig. 84a. Among the curious woodcuts, one shows the legendary kirihōō (phoenix) in flight above the Paulownia tree in which, according to tradition, it would rest, but nowhere else.

Fig. 84b. Indian corn (maize) planted at the edge of water and a duck.

Exhibit 92. Sō Shiseki (Kusumoto), Sō Shiseki Gafu (Picture-album of Sō Shiseki). 3 vols. Kyōto: engravers, Tanaka Heibei and Tanaka Chūshichi; and Edo: book stores, Suharaya Mohei and Suharaya Shiroemon, Meiwa 2 (1765).

Sō Shiseki informs us that his pictures in Vols. I and II are based upon paintings by the Chinese artist Chin Nampin, who lived in Japan (Nagasaki) from 1731 to 1733. Sometimes, to bring out details more clearly, he copied just parts of these pictures. In the third volume he includes some reproductions from paintings only recently received from China, as well as some done in Nagasaki by other, later, Chinese artists.

Fig. 85a. An impressive picture of an eagle or hawk in sumi-e (black varied to gray by drawing the original in various dilutions of India ink; reproduced in printing by partial wiping of portions of the block before making the impression) from Sō Shiseki's book of flowers and birds. Copied from a painting of Chin Nampin, a Chinese artist who lived at Nagasaki.

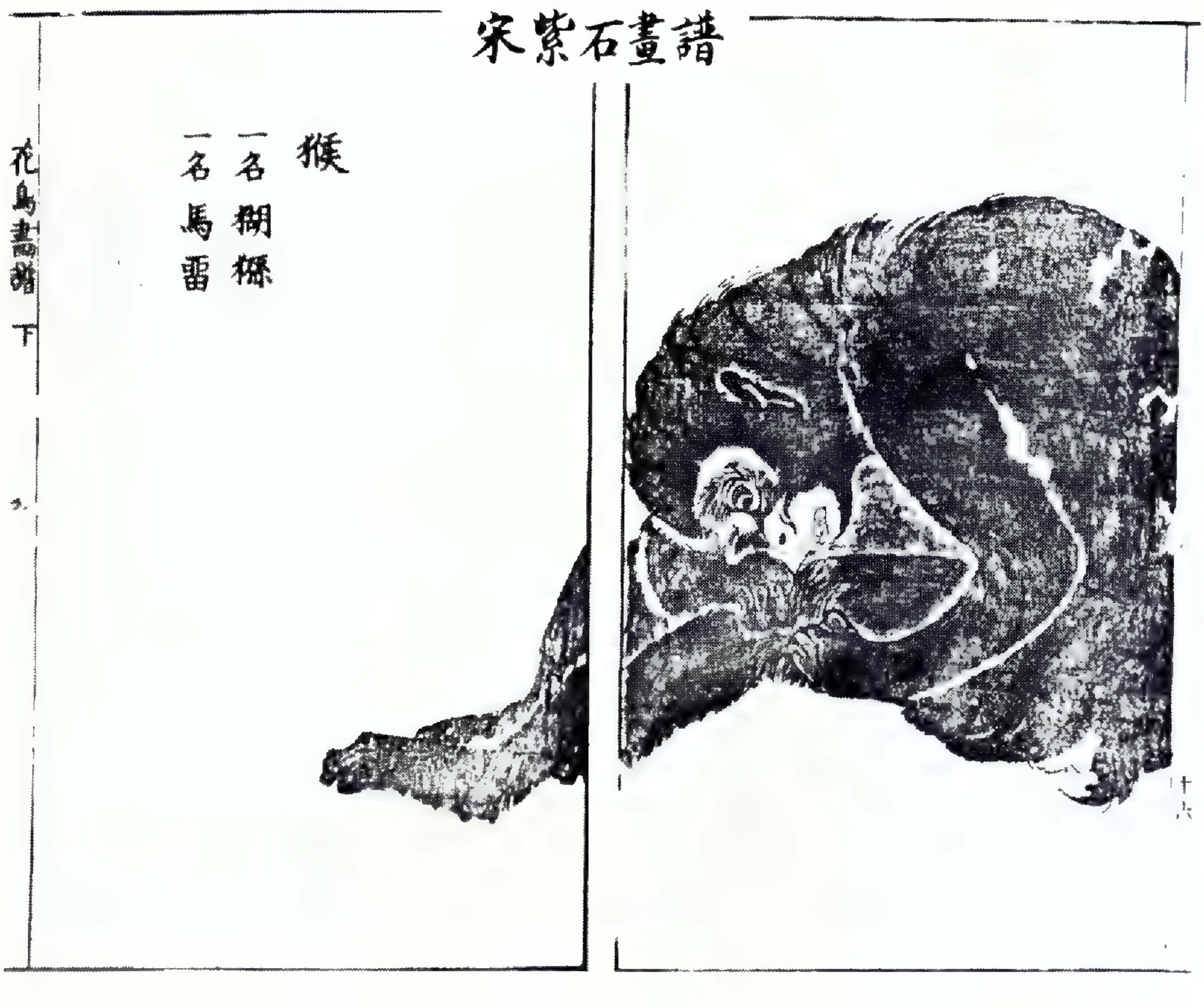


Fig. 85b. An example of Sō Shiseki's unusual type of printing in color without outlines; his figure of a monkey, printed in brown from one block, with modification of tone by wiping. This is from the third volume, and so may not be from an original of Chin Nampin, but from some other Chinese artist.

Exhibit 93. Kitao Shigemasa, Shashin Kachō Zue (Sketches of flowers and birds). 3 vols. Edo: publishers, Okadaya Kishichi and Izumiya Ichibei; Ōsaka, Kashiwaraya Seiemon, Bunka 2 (1805).

The preface tells us that Kitao Shigemasa (1738-1819) intended to complete this kachō, the best known of his works, in fifteen volumes. It came about, however, that only this first series was to be published during his lifetime. A second and much rarer series of three volumes appeared in 1827, and the others never appeared. One of his other works has been rated by collectors among the half-dozen or so most beautiful color block-books of Japan.

Exhibit 94. Kawamura Bumpō, Kimpaen Gafu (Pictures of Kimpa garden). 1 vol. Kyōto: book store, Hishiya Magobei, Bunsei 3 (1820). Prefaces, folded leaves 1 & 2; title page and double-page pictures of flowers, back of second folded leaf 1 through front of fold 35; colophon, back of fold 35.

There are only the briefest references to Bumpō in the standard Japanese biographical dictionaries of artists, but it appears that in later life he excelled in portrait and landscape painting in a very free and facile style. His dates are not known, but he seems to have been active into the Tempo period, which extended from 1830 to 1845.

Brown remarks of this book: "The Kimpayen Gwafu, containing drawings of flowers and printed in colours, without the use of lines to any extent, which appeared in 1820, is one of Bumpō's rarest books and is seldom found now in the first edition. It resembles considerably the Kwa Ryakugwashiki by Keisei Masayoshi, which was published seven years earlier, and which, although a much more famous book than the Kimpayen Gwafu, is no more delightful."

金波園画譜

Fig. 86. Tree peony, botan (Paeonia Moutan; P. suffruticosa) from Kawamura Bumpō, Pictures of Kimpa Garden. The indication of venation of leaves without an extra block is ingenious and effective. It is done by narrow white (i.e., unprinted) lines varying distances apart.

Exhibit 95. Kōno Bairei, Bairei Hyakuchō Gafu (Bairei's album of a hundred birds). 3 vols. Kyōto: publisher, Okura Magohei; and Tōkyō: book store, Kin'eidō, Meiji 14 (1881).

This was Kōno Bairei's first kachō, for in spite of the title it may be so classified, since many of the pictures emphasize the plants as much as the birds. The illustrations in these volumes are in black (with dilutions to gray), orange-brown (with dilutions), and vaguely perceptible tinting of the grays with green or blue. The colors are therefore not realistic and are used for contrast. Being printed from the same block, very different colors of plant parts and of birds appear the same, but if we grant the artist the conventions of his style, the effects are extremely life-like and pleasing.

Fig. 87. A heron and the sacred lotus, Nelumbo nucifera, in a striking composition which is almost without color, and in which the intense black of the upper leaf surface contrasts with the prevailing grays and almost invisible touches of brown of the rest of the picture.

Exhibit 96. Kōno Bairei, Kachō Gafu (Bairei's album of flower and bird pictures). 2 vols., accordion format. Tōkyō: publisher, Ōkura Magohei, 1883.

Two additional volumes are recorded as having appeared 16 years later, in 1899, and one wonders if they may have been originally published earlier, and reprinted in 1899. They have not been seen by us. This work is considered one of the most beautiful of the later fully colored ehon. Its extremely decorative style is in marked contrast with the same artist's earlier collection of chrysanthemum pictures, in which the tints vary only from black to gray and from deep orange to very pale orange. This earlier work had shown a reversion to the then long out-moded technique of sumi-e and tane-e of the period preceding printing in a full range of colors. It is also strikingly different from the fully colored but unadorned flower books of the same painter which are more of the nature of botanical illustrations, lacking all background or other accessory embellishment.

Fig. 88. Passiflora coerulea, shown with a pair of the birds called mamedori or mamemawashi. The passion flower is tokeisō (clock flower), "because from sunrise to sunset the flowers turn clockwise. The mamedori lives in the woods. When brought up from a nestling it can be taught tricks." From Kōno Bairei's Kachō Gafu of 1883.

Exhibit 97. Kōno Bairei (deceased), edited by Kōno Seiko (heir), Kusabana Hyakushu-shiki (A hundred kinds of flowers). 2 vols. (i.e., series) in 4. Kyōto: publisher, Yamada Naosaburō; distributor, Yamada Unsōdō, Meiji 34-37 (1901-1904). (Series 1, Sōka Hyakushu, 2 vols., 1901. Series 2, Sōka Hyakushu Nihen, 2 vols., 1904.)

Kōno Bairei was one of the last of the artists who illustrated plants for wood-block printing and whose work is considered by critics as important. His books were published from 1881 to 1904. His possibly more famous contemporary was Imao Keinen, and others of the group were Watanabe Shōtei and Numata Kashū. All are represented in the exhibition.

Fig. 89. Symplocarpus foetida forma latissima Makino, one of the Japanese plants which is paired by a very similar form (the common skunk cabbage) in the eastern United States. It has

the name Daruma-sō in the Kusabana Hyakushu because, according to tradition, Daruma sat in religious contemplation until his legs and arms had atrophied. Makino gives another name of similar meaning, zazan-sō (priest sitting in meditation). (From the second series of Kōno Bairei's posthumous Kusabana Hyakushu.)

Exhibit 98. Watanabe Shōtei, Shōtei Kachō Gafu (Shōtei's album of birds and flowers). 3 vols. Tōkyō, Ōkura Book Store, Meiji 23 (1890). Preface by Kubo Kambun.

Watanabe Shōtei (born 1851, active until 1903) received his training as an illustrator under the famous Kikuchi Yōsai. He was active as a book illustrator and print designer at least from before 1890 to 1903, and the work shown (Figure no. 90) is a beautiful example of the color woodcut in his later years. Some of his prints appeared in the form of a portfolio in 1915.

Fig. 90. Clump of dandelions almost concealing a bird. From the Shōtei Kachō Gafu.

Kubo Kambun said in the preface that if a painter did not understand the spirit of flowers and the feelings of birds he could not suggest the fragrance of the one or the songs of the other. Until he saw the album of Watanabe Shōtei he did not know that such a painter existed, but here was the proof!

The book exhibited is a conventional kachō, which in coloring harks back to the period just following that in which blocks for pink, red, orange, pale green, black, and gray were used. In this kachō there is also blue. The colors are subdued, some apparently made by dilution. Some of the prints are almost entirely in black and gray, i.e., sumi-e, "ink pictures" in an old Chinese tradition.

Exhibit 99. Imao Keinen, Keinen Kachō Gafu; Haru; Natsu; Aki; Fuyu (Keinen's bird and flower illustrations; spring, summer, autumn, winter). 4 vols. Kyōto: copyrighted and published by Nishimura Sōzaemon; printer and seller, Tanaka Jihei, Meiji 24-25 (1891-1892). Preface by Suzuki Hyakunen, his teacher.

According to Brown "perhaps the most beautiful work of this kind ever printed in Japan." The first edition appeared in 1885, but it is so rare that only subsequent printings can now be procured. All of the published work of Imao Keinen (1845-1924) appears to have been kachō except for a manual of drawing. This second printing is the same as the first except that the eyes of the birds do not have intensified high-lights in lacquer. From the standpoint of fine printing one might prefer the later issue with no mixture of techniques.

One of his beautiful pictures (Fig. 91) appears on the following page.

Fig. 91. The evergreen Torreya nucifera, of the genus named for Asa Gray's great contemporary, John Torrey. There are only three species, one of which, a counterpart of the Japanese species, is sharply localized in the southeastern United States. The other is found in California. Asa Gray published a notable essay on this type of geographic distribution.

Exhibit 100. Numata Kashū, Kachō Gafu, Gaen; Gashū; Gasen; Gasui (Illustrated flowers and birds, Vols. I-V). 5 vols., individually subtitled. Tōkyō: copyright, 1912, Fujii Rihachi; distributor, Matsuyamadō, 1916.

Numata Kashū had published three volumes of beautiful bird and flower pictures in 1890, and these last of his books were issued over a quarter of a century later, although the painting for two (Gashū and Gasen') were done in 1889. In some of the pictures the plants are too sketchily indicated to follow the kachō tradition and the emphasis is wholly on the birds, but the work is a delightful one nevertheless, although one often wishes that the vague vegetation were not merely a background. In some of the pictures the emphasis is more evenly divided.

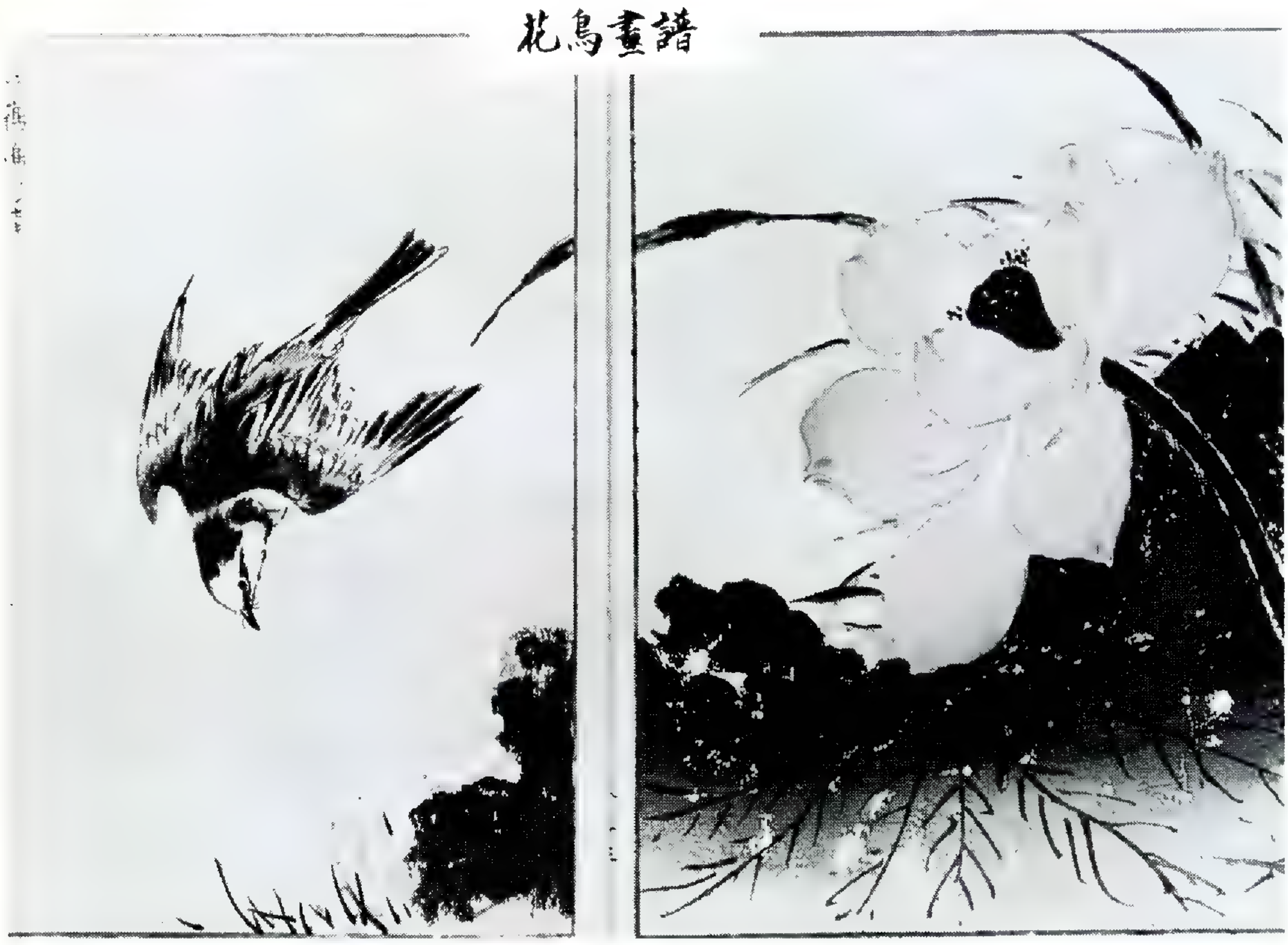


Fig. 92. Nelumbo nucifera, the sacred lotus, and "mottled Japanese wagtail", from Numata's Kachō Gaen, the second volume of the Kachō of 1916.

Exhibit 101. Matsumura Keibun, Keibun Kachō Kinkachō (Keibun's album of birds and flowers). 1 vol. Kyōto: publisher, Yamamoto Renzō; distributors in Nagoya, Tōkyō, and Ōsaka, Taishō 9 (1920).

A collection of impressionistic prints, chiefly interesting as having been issued among the last of the wood-block-printed kachō.

XV. BOOKS OF ART AND PRINTS FOLLOWING THE TRADITION OF PAINTINGS OF THE "FLOWERS OF THE FOUR SEASONS" (Exhibits 102 to 103)

Exhibit 102. Kuwagata Keisai, Sōka Ryakuga-shiki (Simplified paintings of flowering plants). 1 vol. Edo: book stores, Suharaya Ichibei, Suharaya Zengorō, Tsuruya Kinsuke, Ei Heikichi, Takegawa Tōbei), Bunka 10 (1813).

Fig. 93. Kuwagata Keisai's painting of a wilted poppy, one of his simplified paintings of flowering plants printed without use of an outline block.

Kuwagata Keisai (1761-1824) was at one time a follower of the popular ukiyo-e art tradition and painted scenes in Edo. He also produced miniature picture books for people of the laboring class. Later he became a priest. His flower pictures were impressionistic in that they show little detail, but are nevertheless realistic in general form and truthful representations of things as they might appear at dusk. They may have a pale background, and were printed in flat color without an outline block. Their essential realism is indicated by such a one as the picture of the poppy with characteristically drooping bud and flowers, for the artist obviously did it from a cut specimen which had quickly wilted, thus showing a quality in this illustration that reminds us of the old herbal of Brunfels, whose artist drew the flowers wilted if he saw them so!

Exhibit 103. Sakai Hōitsu, Suzuki Sonoichi, and Nakano Sonoaki, Shiki no Hana (Flowers of the four seasons). 10 vols. (Spring, 2 vols.; Summer, 4 vols.; Autumn, 3 vols.; Winter, 1 vol.). Kyōto: edited, published and printed by Yamada Naosaburō; sold at Kyōto Unsōdō book store, Meiji 41 (1908).

This work was published just a century after it was begun. It is so extensive and deals with so many more plants than the conventional "flowers of the four seasons" of most artists that it is botanical as well as artistic in conception. The artist, Sakai Hōitsu (1761-1828), was a son of the Daimyō of Himeji in Harima Province. According to Ikebe Toen, who wrote the preface to the posthumous Shiki no Hana, he had served in the imperial court. According to Brown (12) he became a high priest of the Nishi Hongan-ji Temple in Kyōto toward the end of the 18th century but because of his addiction to art he quickly gave up the priesthood in 1808 and established a school for the perpetuation of the style of Kōetsu and Kōrin. He devoted himself to painting the flowers of the four seasons from living specimens. At the time of his death he had completed several hundred. His disciple Suzuki Sonoichi supplemented the collection and made an album. Later, Nakano Sonoaki (1833-1892) was requested to round out the album to 1000. Until 1908 it remained unpublished, and then Yamada Unsō (pen-name) got permission to publish it.

四季の花

Fig. 94. (Above) A plate from Sakai's Shiki no Hana (Spring, Vol. 1, 24), illustrating Arisaema serratum, Amana edulis and Caltha sibirica, exemplifies Sakai's widely inclusive and botanical, rather than conventional and restricted, treatment of his theme. The work is so extensive that it would have the dimensions of a Japanese flora if it were not entirely unclassified and without text except for a table of contents.

(Below) Litchi chinensis (from another plate of Sakai's Shiki no Hana) is a tree that bears one of the most delicious of Oriental subtropical fruits, the lichee. It is illustrated with mature fruit (but they had no Chinese name for it) among the "flowers of autumn". Miss Su-Ying Liu, special student of the lichee, knows no specific record of it succeeding as an orchard tree north of the 26th parallel, and suggests that it may have fruited as far north as Kyōto only as a somewhat dwarfed potted tree, protected from winter weather. Such potted specimens may well have been imported from southern China into Japan, for there is record that such were sent as tribute to the Chinese imperial court at Peking and were kept alive, but could not be set in the open ground.

XVI. BOOKS ILLUSTRATING IKEBANA,

THE ART OF FLOWER ARRANGEMENT
(Exhibits 104 to 106)

Exhibit 104. Inukai Sanzaemon, editor, Rikka Hyakuhei Zu (Rikka flower arrangement in a hundred vases). 2 vols. Kyōto: book store, Kikuya Yasubei, Bunka 9 (1812).

One hundred illustrations of flower arrangements by teachers of several generations of the Ikenobō school, with their names.

One of the formal and symbolic flower arrangements of Buddhist ritual called rikka shows little variety of plant material and with pine usually predominating.

Fig. 95. We have chosen for illustration, however, one in which only the lotus (Nelumbo nucifera), , sacred to the Buddhists, was used.

Exhibit 105. Hōunsai Akisue, Sōka Zu (A picture of flower arrangement). 1 vol. Kansei 8. MS book of flower arrangement with 20 watercolor illustrations of exceedingly simple flower arrangements, each with artist's signature and seal, and, as a frontispiece, a double-page painting of Mt. Fuji with a nobleman on horseback and two attendants on foot in the foreground.

Fig. 96. A simple arrangement of the sacred lotus; an example of a formal composition making use of just one kind of plant.

Exhibit 106. Bajō [pen name], Enshūryū Sōka Hyakuhei Zu (Illustrations from the Enshū flower-arrangement school). 2 vols. Edo, 1805.

遠州流挿花百瓶圖

Fig. 97. Avoiding the more artificial elaborate arrangements of several symbolic species, we choose for reproduction from Bajō's work on Enshū flower arrangement an illustration of single species, the Japanese hemp palm, Trachycarpus excelsa.

XVII. BOOKS ON PROPAGATION AND CULTIVATION OF PLANTS; GARDEN CRAFT AND GARDENS
(Exhibits 107 to 110)

Exhibit 107. Akizato Ritō, Torinsen Meishō Zue (Illustrations

of famous landscape gardens in the city). 6 vols. (Prefatory vol.; Vols. I-V). Kyōto: book store, Yoshinoya Tamehachi; Edo: book store, Suharaya Zengorō, Kansei 11 (1799). Artists: Sakuma Sōen, Nishimura Chūwa, and Narimoto Sadaaki, each of whom signed his own pictures.

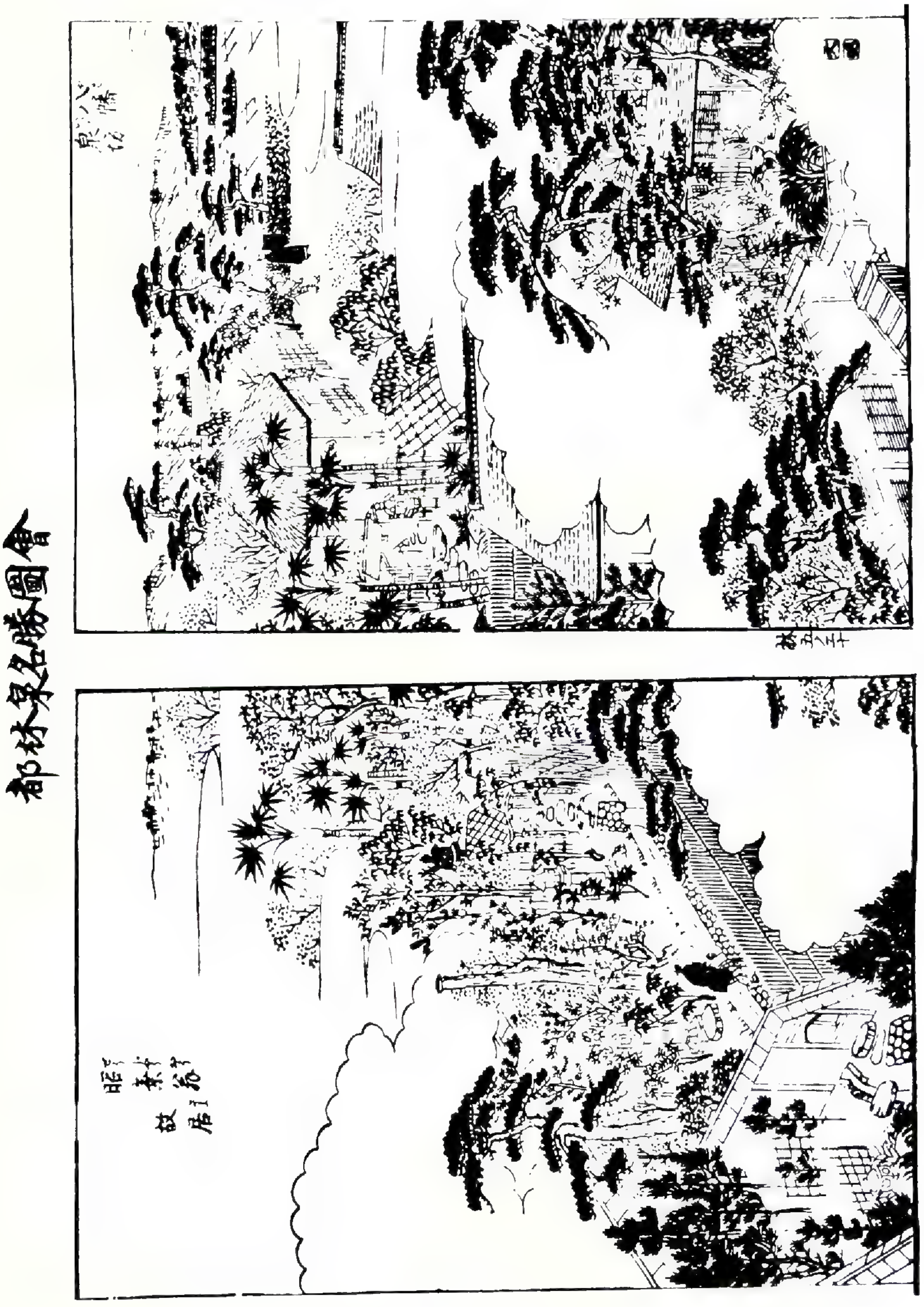


Fig. 98a. A Kyōto garden of the late 18th century, showing Trachycarpus excelsa, the Japanese hemp-palm, which was

here used in garden design at about its northern limit of hardiness.

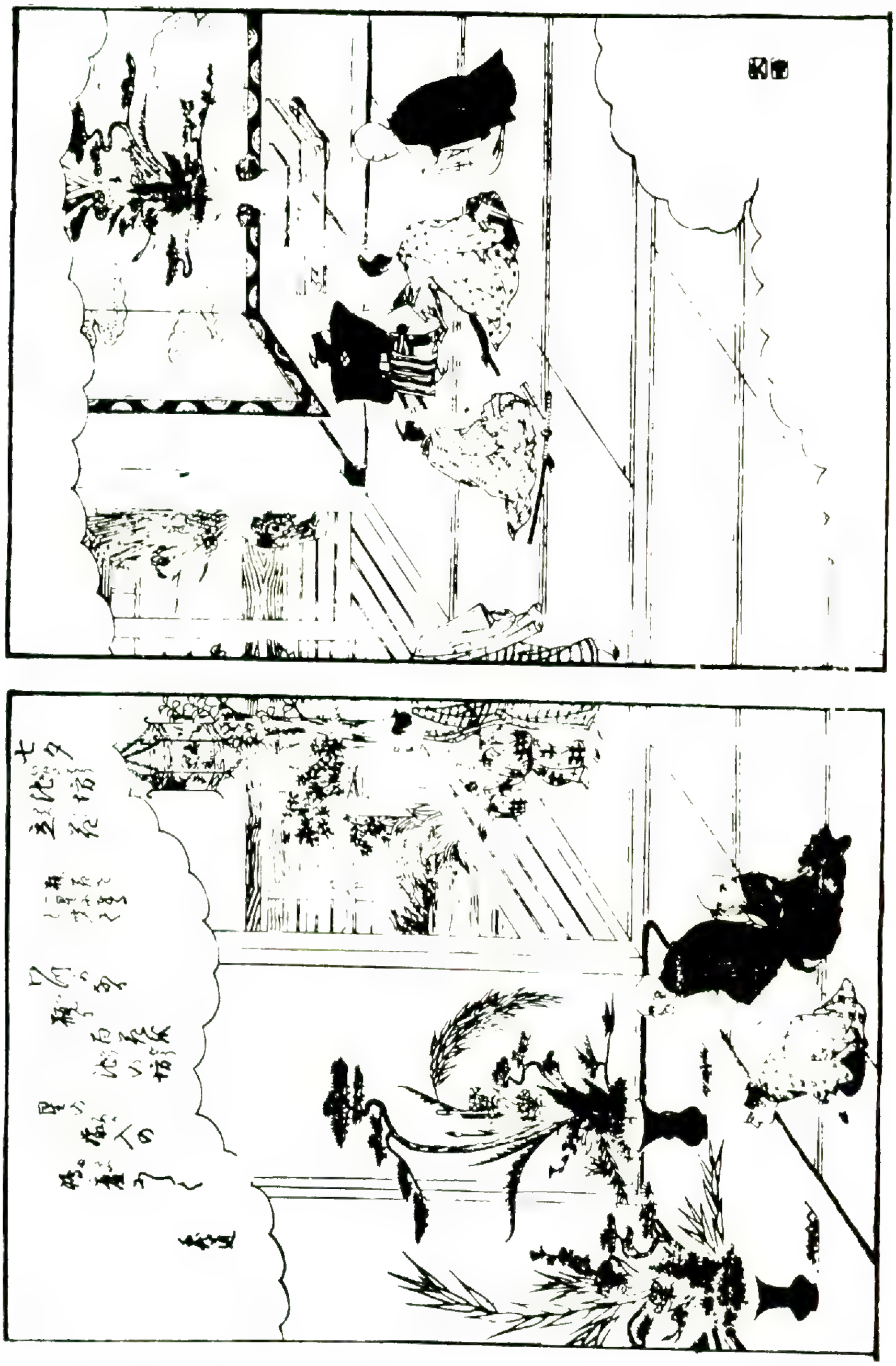


Fig. 98b. Reception room at the Nishi Rokujō Honganji (temple) on the occasion of the tanabata, festival of the weavers, which fell on July 7th of the lunar calendar. The flowers were dedicated to the temple by the principal retainers of the daimyō, and the people came to view the arrangements.

This work was based upon Tsukiyama Teizōden (Record of

building gardens) but with additional pictures. It treats especially (but not exclusively) of rinsen, landscape gardens containing clusters of trees, usually with running water. The author did not find as many poems about gardens as he wished, and so asked several famous people of Kyōto to write some. These he included in his book, together with his own.

Exhibit 108. Hiraga Gennai, editor, Hiden Hana-kagami (Secret flower lore mirrored). Edo: book store, Suharaya Heisuke; Ōsaka: book store, Tsurugaya Kyūhei; Kyōto: book stores, Hayashi Gombei and 2 others. 6 vols. An'ei 2 (1773).

Vol. I, floral calendar; Vol. II, eighteen lessons on the care and propagation of plants; Vol. III, one hundred flowering trees described and illustrated; Vol. IV, vines and bamboos; Vol. V, herbaceous flowering plants; Vol. VI, how to raise animals, including fish and insects.

The figures of this work, a Japanese version of a Chinese original of 1688, are amazingly crude. Nevertheless, we reproduce the introduction from America, Opuntia Ficus-indica, generically so distinctive as hardly to be mistaken for anything else in the plant kingdom. The old author tells us that this cactus, for which the Chinese characters are rendered in Japanese as saboten or sambotei, came from Fukukenshō and Kōtōshō in China. "It is neither fruit nor vegetable; it has no branches, no leaves, no flowers; the skin is blue green and glistens. Every year only one joint comes up: if one grows at the left, the following year one grows on the right. If it is planted in the house, it prevents a conflagration. If one wants to raise the cactus, take one joint, cut it into 3 or 4 pieces and stick them into fertile ground. It grows."

Fig. 99. Opuntia Ficus-indica, an American prickly-pear, probably introduced into Japan in the early years of Portuguese contact. The kind there cultivated has come to be called Opuntia Ficus-indica var. Saboten Makino, or Opuntia Saboten Makino, from the vernacular name in Japanese.

Exhibit 109. Iwakaki Tsunemasa, Sōmoku Sodategusa (Cultivation and care of plants). 2 vols. Kyōto: book store, Uemura Tōemon; Ōsaka: book store, Okadaya Kishichi; and Edo: book store, Sudahara Mohei, Bunka 15 (1818).

This work was used as a basis for a second with the same title, by Abe Yoshito (q. v.).

Fig. 100. Two methods of grafting, as described and illustrated by Iwasaki. In one the rooted stock was to be dug and balled in a split bamboo bark, or rope wrapper, permitting regular watering by soaking, drenching, or rain. This was bound to a stake for support and grafted to a twig of the plant serving as scion. After union took place, the scion would be detached from its parent plant, and the balled stock would be planted. The second method was similar, and could be practiced only if the undetached scion could be bent down so as to be bound onto an undug stump, or one heeled into the ground.

Exhibit 110. Abe Yoshito, Sōmoku Sodategusa, Jō; Ge (On the cultivation and care of plants. Second series. Vols. I and II). 2 vols. Edo: publishers, Senshōbō, Gyokusandō, Mankyūdō, Tempo 8 (1837).

This work is supplementary to the one by Iwasaki Tsunemasa with similar title. The author states that he laid down 19 rules in Vol. I and 160 in Vol. II, but even then may have omitted important ones. In addition to giving more information than his predecessor had given on propagation, forcing early flowering, combatting pests, etc., he wrote a first chapter on the beginnings of the Imperial gardens.

A potted dwarf conifer (Fig. 101) is illustrated on the following page.

草本育種後編

Fig. 101

Fig. 101. Illustration from Abe Yoshito of a potted dwarf conifer top-worked at many places for development of a dwarf "tree" with a desired and preestablished form and type of branching.

XVIII. TEXTBOOKS SHOWING THE BEGINNING OF WESTERN INFLUENCE (Exhibits 111 to 112)

Illustrations of Exotic Plants Copied from European Books; the Early Use of Latin Nomenclature; the Appearance of Dutch or Malay Common Terms

Exhibit 111. Udagawa Yuan, Shokugaku Keigen. Rigaku Nyūmon (Introductory study of botany). 3 vols. Edo: publishers, Sōrei-kaku, Suharaya Ihachi, Tempo 4 (1833). Later issue. 3 vols. in 1. Content unchanged but different pigments used for printing the colored illustrations.

The author is notable for his pioneering efforts in introducing European science and modes of instruction. The book is important in its translation of technical terms from Dutch into Japanese.

The following illustration from the botanical textbook of Udagawa Yuan shows that whatever the immediate source may have been, the ultimate source for stem cross-section was the famous Vegetable Anatomy of Nehemiah Grew, published by the Royal Society of London.

See Fig. 102 on the following page.

Fig. 102. From Udagawa Yuan's Shokugaku Keigen

Exhibit 112. Ono Shokui, translator, Shokugaku Senkai (Introduction to botany). Edited by Kubo Kōdō. Inspected by Tanaka Yoshio. Ministry of Education, 1874.

This work, according to the preface, is modified from the

unidentified European original (Plants for schools) by the substitution, in part, of Japanese for Western plants, by an increased number of illustrations, and in various other ways. In spite of the perfection and clarity of the characters this is not printed from type, but is an old-style block-printed volume.

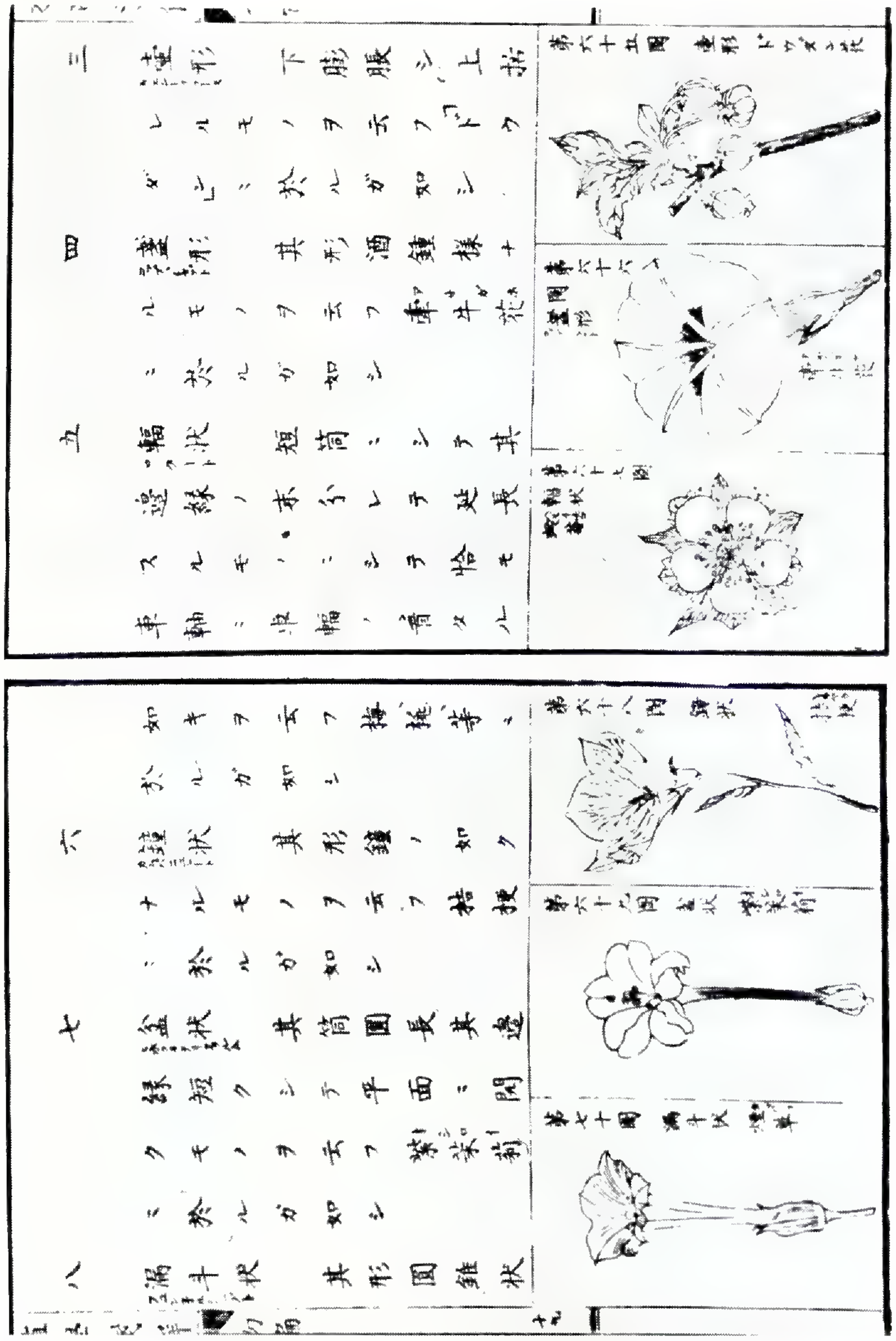


Fig. 103. A page from the botanical text book of the Ministry of Education, showing use of text figures to demonstrate various types of flower structure. It is said that copies of such early

text-books based upon European models are displayed in many educational museums of Japan on account of their great historical interest in connection with the introduction of Western learning.

LITERATURE CITED

(1) Anderson, William. Burlington Fine Arts Club. Catalogue of Prints and Books Illustrating the History of Engraving in Japan. Printed for the Burlington Fine Arts Club, 1888.

(2) Aston, William George. A History of Japanese Literature. New York, 1899.

(3) _____. Shinto, the Way of the Gods. London and New York, 1905.

(4) Batchelor, John. The Ainu of Japan. London, 1892.

(5) _____. Ainu Life and Lore: Echoes of a Departing Race. Tōkyō: Kyōbunkan, n. d. (1927?).

(6) Beans, George H. A List of Japanese Maps of the Tokugawa Era. Jenkintown, Penn. Tall Tree Library, Publication No. 23, 1951.

(7) Beardsley, Richard K., Cornell, John B., and Norbeck, Edward. Bibliographical Materials in the Japanese Language on Far Eastern Archaeology and Ethnology. The Center for Japanese Studies, University of Michigan, Bibliographical Series, No. 5. Ann Arbor, 1950.

(8) Binyon, Laurence. A Catalogue of Japanese and Chinese Woodcuts in the Sub-department of Oriental Prints and Drawings in the British Museum. London, 1916.

(9) Bretschneider, Emil. "History of Materia Medica and Botany in Japan." Reprinted from Journ. N. China, British Asiatic Society, Vol. 16. In his Botanicum Sinicum, pp. 96-101. 1882.

(10) Brinkley, Frank (ed.). Japan: described and illustrated by the Japanese. Boston, Mass., 1897-1898.

(11) British Museum Catalogue (Natural History): Catalogue of the books, manuscripts, maps and drawings in the British Museum. Vols. I-V, 1903-1915; Supplement, Vols. VI-VIII, 1922-1940. Printed by order of the Trustees, London.

(12) Brown, Louise Norton. Block Printing and Book Illustration in Japan. London and New York, 1924. With 43 plates,

and copious indexes of titles and articles.

(13) Chamberlain, Basil Hall. Translation of Kojiki (Records of ancient matters). 2nd ed. with annotations by the late W. G. Aston, ... Kōbe, 1932.

(14) _____. The Language, Mythology, and Geographical Nomenclature of Japan, viewed in the Light of Ainu Studies ... including "An Ainu Grammar" by John Batchelor, and a Catalogue of Books relating to Yezo and the Ainu. Memoirs of the Literary College, The Imperial University of Japan, No. 1. Tōkyō, 1887.

(15) Cole, Allan B. (ed.). A Scientist with Perry in Japan: the Journal of Dr. James Morrow. Chapel Hill: University of North Carolina Press, 1947.

(16) Conder, Josiah. The Flowers of Japan and the Art of Floral Arrangement. Tōkyō, 1891.

(17) Courant, Maurice A. L. M. Catalogue des Livres Chinois, Coréens, Japonais, etc. 8 parts in 3 vols. Paris, 1902-1912.
(Chinese sections only, but useful for locating Chinese books of which there are Japanese editions.)

(18) Dai-Nihon Jimmeisho (Dictionary of Japanese names). Tōkyō: Dai-Nihon Jimmei Jisho Kankōkai, 1937.

(19) Dai-Nihon Shoga Meika Taikan (Dictionary of famous calligraphers and painters of Japan). Tōkyō, Dai-Nihon Shoga Meika Taikan Kankōkai, 1934.

(20) Dickins, F. Victor. The Manga of Hokusai. Katsushika Hokusai: a biography from the Jimmei Jisho. 6 (part 3): 276-305, 11 plates. London: Trans. Proc. Japan Soc., 1905.

(21) Dickson, Sarah A. "Panacea or Precious Bane. Tobacco in Sixteenth Century Literature." Tobacco is christened by the Herbalists. Bull. New York Public Library. 57: 471-496. 1953.

(22) Douglas, Robert Kennaway. Catalogue of Japanese Printed Books and Manuscripts in the Library of the British Museum. London, 1898.

(23) _____. Catalogue of Japanese Books and

Manuscripts acquired during the years 1899-1908. In British Museum. London, 1909.

(24) _____. Japanese Illustrated Books. Bibliographica 3: 1-28. 1897.

(25) East, Alfred. "Some Aspects of the Art of Hokusai." 5: 96-113. London: Trans. Proc. Japan Soc., 1898-1901.

(26) Ficke, Arthur Davison. Chats on Japanese Prints. London, 1915.

(27) Franchet, A. et Savatier, Lud. Enumeratio Plantarum in Japonia sponte crescentium hujusque cognitarum adjectis descriptionibus specierum pro regione novarum quibus accedit determinatio herbarum in libris japonicis Somoku Zoussets zylographice delineatarum. 2 vols. Paris, 1875-1879.

(28) Fujikawa, Yū. A Brief Outline of the History of Medicine in Japan. In Scientific Japan, Past and Present: Prepared in connection with the Third Pan-Pacific Science Congress. Chap. XI, pp. 229-242. Tōkyō, 1926.

(29) Geerts, A. J. C. Les produits de la nature Japonaise et Chinoise. 2 vols. Yokohama, 1876 and 1883.

(30) Goncourte, Edmond de. "Hokusai: ses albums traitant de la peinture et du dessin, avec ses préfaces." Gazette des Beau-Arts, sec. 3, 14: 441-452, 1895.

(31) Gundert, Wilhelm. Die japanische Literature. Potsdam, 1929.

(32) Hall, John W. Japanese History: A Guide to Japanese Reference and Research Materials. University of Michigan, Center for Japanese Studies. Bibliographical Series, No. 4. Ann Arbor, 1954.
A bibliography of 1551 titles, including a few in the history of science in Japan.

(33) Hawks, Francis L. Narrative of the Expedition of an American Squadron to the China Seas and Japan, Performed in the Years 1852, 1853, and 1854, under the Command of Commodore M. C. Perry, United States Navy, by Order of the Government of the United States. Compiled from the original notes and journals of Commodore Perry and his officers, at his request and under his supervision. Vol. I. Washington, 1856.

Vol. II, edited by Perry himself, consisted of individually signed reports by himself and other officers of the Expedition, and by civilian specialists who contributed scientific papers. See Perry (53).

The official refusal to allow the publication of the private journals kept on the Expedition was violated at least in spirit by the Commander's clerk J. W. Spalding (79) who admitted only reliance on "scattered memoranda" and "jottings to friends." His book is a rather ill-tempered account of the Expedition. Fifty years after return of the Expedition, John S. Sewall published a personal account (67) dedicated "to the survivors of the Perry Expedition to Japan in 1853-1854." He had been Captain's clerk on the "Saratoga." The unofficially published journal of special interest to botanists was that of Dr. James Morrow, which was conscientiously kept and duly submitted to the Navy, but was overlooked and neither used nor returned to its author. It has recently been edited by Allan B. Cole (15).

(34) Hildreth, Richard. Japan, as it Was and Is. A Handbook of Old Japan. Boston and New York, 1858; Chicago, 1906.

(35) Iwasaki, Tsunemasa. Honzō Zufu (Illustrated plants). 96 vols., containing over 1000 plants. Tōkyō, 1928.

(36) Jenny, Walter Proctor. "Experiments in Hybridizing Japanese Flowers which seem to show a variation in Mendel's Law." Scientific American, Supplement, 79: 18-19. Jan., 1915.

(37) Kaempfer, Engelbert. Amoenitatum Exoticarum Politico-physico-medicarum Faciculi V ... Lemgoviae, 1712.

(38) _____. De Beschryving van Japan ... Amsterdam, 1733.

(39) Klaproth, Julius Heinrich. Catalogue des Livres imprimées ... chinois, japonais, etc., composant la bibliothèque de feu M. Klaproth ... Paris, 1839.

(40) Koshimizu, Takuji. Manyōshū Shokubutsu. Shashin to Kaisetsu (Manyō plants, illustrated and described). Revised ed. Tōkyō, 1943.

(41) Laporte, Otto. Catalogue of Ann Arbor Art Association Exhition of Locally-owned Japanese prints ... April 26 - May 10, 1931. 21 pp. Ann Arbor, 1931.

(42) Laufer, Berthold. Descriptive Account of the Collection of Chinese, Tibetan, Mongol, and Japanese Books in the Newberry Library. Chicago, 1913.

(43) Ledoux, Louis V. A Descriptive Catalogue of an Exhibition of Japanese Landscape, Bird and Flower Prints and Surimono, from Hokusai to Kyosai. New York: The Grolier Club, 1924.

(44) _____. Japanese Prints of the Primitive Period in the Collection of Louis V. Ledoux. New York, 1942.

(45) Lombard, Frank Alanson. Pre-Meiji Education in Japan: A Study of Japanese Education previous to the Restoration of 1868. Tōkyō, n. d. (1914?).

(46) Makino, Tomotarō. Nihon Shokubutsu Zukan (An illustrated flora of Japan with the cultivated and naturalized plants). Tōkyō and Kyōto: Hokuryūkan, 1940.

(47) Merrill, Elmer Drew and Walker, Egbert Hamilton. A Bibliography of Eastern Asiatic Botany. Sponsored by the Smithsonian Institute, Arnold Arboratum of Harvard University, New York Botanical Garden, Harvard-Yenching Institute, 1928.

(48) Murakawa, K., Richard Hildreth. Japan, as it Was and Is, edited with Supplementary Notes by K. Murakawa. 2nd Japanese ed. Tōkyō, 1905.

(49) Murakoshi, Michio (ed.). Genshoku Zusetsu Shokubutsu Dai-Jiten (Dictionary of botany, illustrated in original colors). Tōkyō: Chūbunkan, 1938.

(50) Nordenskiöld, A. E. The Voyage of the Vega around Asia and Europe ... Translated by Alexander Leslie. New York, 1882.

(51) Ota, Akira (ed.). Seishi Kakei Dai-Jiten (History of family names and genealogy). Tōkyō: Keifu Gakkai, 1938.

(52) Papinot, E. Historical and Geographical Dictionary of Japan. Yokohama: Kelly and Walsh, 1910. Reprinted at Ann Arbor, Mich., 1948.

(53) Perry, M. C. (ed.). Narrative of the Expedition of an American Squadron to the China Seas and Japan, performed in the years 1852, 1853, and 1854, under the Command of Commodore M. C. Perry ... Vol. II. Washington, 1856.

(54) Rein, J. J. The Industries of Japan, together with an Account of the Agriculture, Forestry, Arts and Commerce. New York, 1889.

(55) _____. "Zur Geschichte der Verbreitung des Tabaks und Mais in Ostasien i. e. Japan." Petermann's Geog. Mitt-heilungen 24: 215-217. 1878.

(56) Rémuset, Jean Pierre Abel. Observations sur l'état des sciences naturelles chez les peuples de l'Asie orientale. Mem. Acad. Inscript. Belles-lettres. 10: 116-167. Paris, 1833. (See also Melanges posthumes d'histoire et de litterature orientales. Paris, 1843.)

(57) Revon, Michel. Étude sur Hoksai. Thèse presentée à la Faculté des lettres de Paris. Paris, 1896.

(58) Rosny Leon de. Catalogue de la bibliothèque japonaise de Nordenskiöld. Paris, 1883.

(59) _____. Introduction à l'étude de la litterature japonaise. Paris, 1896.

(60) Ryū, Susumu. Sekai Insatsu Tsūshi (The world history of printing). Vol. 1, History of Printing in Japan. Tōkyō, 1931.

(61) Sasaki, Nobutsuna et al. (Special Manyōshū Committee). The Manyōshū. One thousand poems selected from the Manyōshū and translated from the Japanese. Published for the Nippon Gakujuku Shinkōkai (Society for the promotion of scientific research). Tōkyō: Iwanami Shōten, 1940.

(62) Savatier, L. Botanique Japonaise: Livres Kwa-Wi traduit du Japonais avec l'aide de M. Saba par de Dr. L. Savatier. Paris, 1875.

(63) Sawada, Akira (ed.). Nihon Gaka Jiten (Dictionary of names of Japanese painters). 2 vols. Tōkyō: Kigensha, 1927.

(64) Schmeltz, J. C. E. Catalogus van's Rijks Ethnographisch Museum. Deel III. Catalogus der Bibliotheek. Leiden, 1909.

(65) Seidlitz, W. von. Geschichte des japanischen Farbenholz-schnitts. Dresden, 1897.

(66) Serrurier, L. Bibliothèque japonaise. Catalogue raisonné des

livres et des manuscrits japonais enregistrés à la Bibliothèque de l'Université de Leyde. Leyde, 1896.
An important bibliography listing Japanese books which had been registered at the Library of the University of Leyden from various Government institutions. Including the basic collection of the University itself, the National Museum of General Ethnography, and the National Herbarium, it lists 1263 numbered titles, each of distinct work, for successive editions are indicated by letters under the number assigned to the oldest edition catalogued. All fields of literature are included down to about 1880.

(67) Sewall, John S. The Logbook of the Captain's Clerk. Bangor, Maine, 1905.

(68) Shimonaka, Yajirō (ed.). Dai Hyakka Jiten (The Japanese encyclopaedia). Tōkyō: Heibonsha, 1931.

(69) Shimonaka, Yasaburō (ed.). Shinsei Jimmei Jiten (Revised dictionary of names). Tōkyō, 1943.

(70) Shirai, Mitsutarō. A Brief History of Botany in Old Japan. In Scientific Japan past and present: Prepared in connection with the Third Pan-Pacific Science Congress. Chap. X, pp. 213-227. Tōkyō, 1926. (Shirai rendered his given name in rōmaji as Mitsutarō, in hiragana as Kōtarō.)

(71) Shirai Kōtarō. Nihon Hakubutsugaku Nempyō (Chronological tables of Japanese studies of natural history, revised). 3d printing. Tōkyō: Ōka Shōten, 1943.

(72) Siebold, Phillipp Franz von and Hoffmann, J. Catalogus Librorum et Manuscriptorum Japonicorum a Ph. Fr. de Siebold Collectorum, annexa enumeratione illorum, qui in Museo Regio Hagano servantur. Lugd.-Bat., 1845.

(73) Siebold, Phillipp Franz. Einige Worte ueber den Zustand der Botanik auf Japan. Nov. Act. physico-med. Acad. Caesar. Leop.-Carol. 14: 670-696. 1828.

(74) _____. Fauna Japonica. Leiden, 1838.

(75) _____. Flora Japonica ... Sectio prima ... Digessit Dr. J. G. Zuccarini. Leiden, 1835-1870.

(76) _____. Geographical and Ethnographical Elucidations to the Discoveries of Maerten Gerrits Vries, Commander of the Flute Castricum, A.D. 1643, in the

East and North of Japan. Amsterdam and London, 1859.

(77) _____. Nippon: Archiv zur Beschreibung von Japan. Vollstandiger Neudruck ... 5 vols. Berlin, 1930-31.

(78) _____. Nippon: Archiv zur Beschreibung von Japan ... Neudruck. 2 vols. Berlin, 1930. (Especially valued because of the prefaced biography by his son.)

(79) Spalding, J. W. The Japan Expedition: Japan and around the World: an Account of three Visits to the Japanese Empire ... New York, 1855.

(80) Stewart, Basil. Subjects Portrayed in Japanese Colour-Prints. London, 1922.

(81) Strange, Edward F. The Colour-Prints of Japan: an Appreciation and History. London, 1914.

(82) _____. Hokusai: the Old Man Mad with Painting. London, 1906.

(83) _____. Japanese Illustration: a History of the Arts of Wood-Cutting and Colour Printing in Japan. Ed. 2. London, 1904.

(84) Tamura, Tsuyoshi. Art of the Landscape Garden in Japan. Tōkyō: Kokusai Bunka Shinkōkai (The Society for International Cultural Relations), 1935.

(85) Thevet, Andre. Les Singularités de la France Antarctique, autrement nommée Amerique ... Paris, 1558.

(86) Thunberg, C. P. Flora Japonica systema Plantas Insularum Japonicarum secundum Systema Sexuale emendatum redactas ... Lipsiae, 1784.

(87) _____. Voyage en Afrique et en Asie, principalement au Japon, pendant les années 1770-1779 ... traduit du Suédois ... Paris, 1794.

(88) _____. Voyages ... au Japon, ... traduits, rédigés et augmentés ... par L. Langlès ... et revus ... par J. B. Lamarck ... 4 vols. Paris, 1796.

(89) Titsingh, Isaac. Illustrations of Japan ... translated from the French by Frederic Schoberl. London, 1822. (Contains

a list of Japanese books collected by Titsingh.)

(90) Toda, Kenji. Descriptive Catalogue of Japanese and Chinese Illustrated Books in the Ryerson Library of the Art Institute of Chicago. Chicago, 1931.

(91) Ueda, Sampei. Nihon Yakuenshi no Kenkyū (Historical studies of the gardens of medicinal plants in Japan). Tōkyō, 1930.

(92) Utamaro (Kitagawa) (1754-1806). His representative works: portrait painting; picture books of selected insects; picture books of flowers; sketches. Some are entitled with waka.

(93) Wood, Mary Cokely. Flower Arrangement Art of Japan. 5th printing. Tōkyō and Rutland, Vermont, 1959.

(94) _____. "History and Philosophy of Japanese Flower Arrangement." Asa Gray Bulletin, N. S. Vol. III, No. 1, pp. 3-26, 1955.

(95) Yamanaka, Sadajirō. Catalogue of the Exhibition of Omi-e. Arranged through the courtesy of Yamanaka and Co., New York, under the auspices of College Art Association. On view at the University of Michigan, Ann Arbor, Mich. 8 pp. n. p., n. d. (Preface dated 1932).

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Japanese botany he had the collaboration of Professor Hide Shohara of the University of Michigan, who ultimately assumed the responsibility for the completion of the entire article, and herself contributed the annotated bibliography that forms the second part of it. We are honored to present this joint contribution by two distinguished scholars.

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